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NAVAL POSTGRADUATE SCHOOL

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TECHNICAL REPORT

A SYSTEMS ENGINEERING APPROACH FOR GLOBAL FLEET STATION ALTERNATIVES IN THE GULF OF GUINEA

by

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This Systems Engineering and Analysis Cohort 12 (SEA-12) report applies a systems engineering process to the largely qualitative Global Fleet Station (GFS) Concept, and its role in ensuring stability in the regions of the world. We apply a slightly modified JCIDS process, with a focus on providing "value-based" results. A regional focus on the Gulf of Guinea is selected. Measures are derived in the form of attributes – or specific capabilities – desired of GFS based on the needs and issues of the region. Vessels from the Navy's current inventory are evaluated for their performance and cost, and two, an LPD and HSV, are selected as the most cost-effective proposals for employment as a GFS in the Gulf of Guinea in 2012. Other solutions are evaluated as well: a future-concept ship, improvements to existing platform alternatives, and considerations for improving integration and interaction with agencies outside the Department of the Navy.

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ABSTRACT

This Systems Engineering and Analysis Cohort 12 (SEA-12) report applies a systems engineering process to the largely qualitative Global Fleet Station (GFS) Concept, and its role in ensuring stability in the regions of the world. We apply a slightly modified JCIDS process, with a focus on providing "value-based" results. A regional focus on the Gulf of Guinea is selected. Measures are derived in the form of attributes – or specific capabilities – desired of GFS based on the needs and issues of the region. Vessels from the Navy's current inventory are evaluated for their performance and cost, and two, an LPD and HSV, are selected as the most cost-effective proposals for employment as a GFS in the Gulf of Guinea in 2012. Other solutions are evaluated as well: a future-concept ship, improvements to existing platform alternatives, and considerations for improving integration and interaction with agencies outside the Department of the Navy.

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Executive Summary

Our Approach

In applying a systems engineering approach to Global Fleet Station (GFS), the Systems Engineering Analysis students in Cohort 12 (SEA-12) confront what many might consider a non-engineering subject: influencing stability and security in the world's regions. Although similar to Policy Analyses, this particular application is pioneering, as it offers a deliberate, systematic means by which to determine solutions to social, political, natural, military and economic issues that threaten peace - as opposed to reactions based solely on human intuition, experience and bias. As one might expect, the solutions are not simple system outcomes. Although we do endeavor to make GFS *the* solution to regional issues in the Gulf of Guinea, the outcomes of our study involve not only system proposals, but process solutions as well.

Integrated Study

System Engineering Analysis Cohort 12's (SEA-12) capstone, integrated project includes personal, e-mail, and phone interactions with various academic institutions, system commands, and operational organizations. Some of the schools, agencies, and organizations conferred with are represented below.

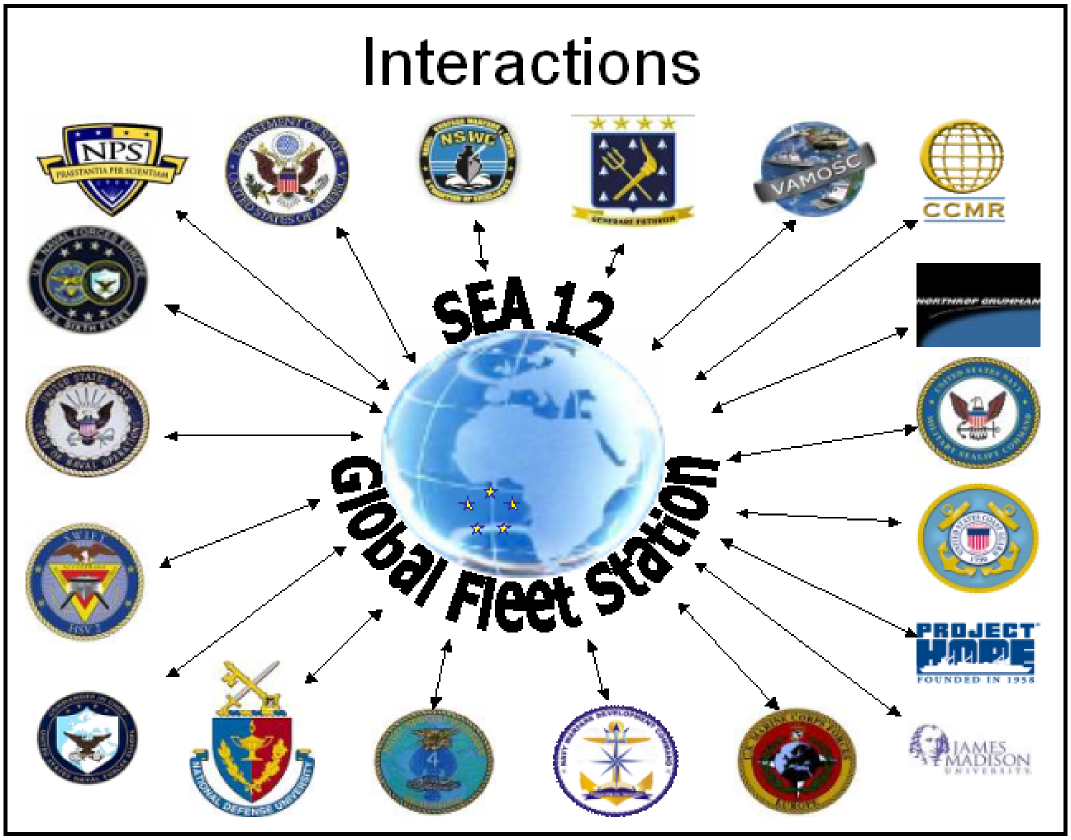

Figure 1: SEA-12 Interaction Across Campus and Beyond

The Method

Our particular method is a modification of the Joint Capabilities Integrated Development System (JCIDS), chosen for its wide use throughout the Department of Defense, as well as its reflection of fundamental characteristics of Systems Engineering. Consisting of Strategic Guidance, Functional Area Analysis (FAA), Functional Needs Analysis (FNA), and Functional Solutions Analysis (FSA), it identifies the desires of our senior leadership, discovers the needs of our region of interest, determines the ability of the naval services to address those needs, and offers solutions to close any "gaps" between what we have and what we hope to achieve, respectively. Value Engineering, decision theory, and cost and risk analysis comprise adaptations to JCIDS that we deem important to providing realistic system solutions for GFS, truly suited to the environment in which they will operate.

GFS Definition

From general literature research, and gaining greater understanding of why GFS is being called for through a detailed review of strategic guidance issued by the President, the Secretary of Defense, and the naval service chiefs, we define GFS as the following:

> **A sea base of operations from which to coordinate and launch a variety of missions within a regional area of interest, focusing primarily on Phase 0/Shaping and Stability operations, to include Theater Security Cooperation, Maritime Domain Awareness, and tasks associated with the war on terror.**

It is important to recognize the importance of specific terms. "Sea base" is meant to imply the location from which GFS will operate - from the sea - and is not intended to infer that it shall be part of the Sea basing program. This maritime orientation obviously impacts what type of system solutions may comprise GFS, and in the case of our study, results in the consideration of ship platforms, only. "Phase 0/Shaping and Stability" provides the operational "umbrella" under which GFS will seek to work within, and enforces its role as one related to peaceful and cooperative engagements with host nations - not as a staging base for hostile employment. Our opinion is that should hostilities commence and call for a need above self-defense, or active participation with host-nation forces (at their request), the GFS will be augmented or replaced by other combatant forces.

Problem Statement and Regional Focus

SEA-12's problem statement also emanates from strategic guidance, as well as from the desire to provide boundaries within which to work.

> **Evaluate Global Fleet Station system alternatives to provide the most effective solution to execute Maritime Security and Influence Operations in the Gulf of Guinea, projected to 2012.**

Of note is the term "most effective:" though the "best" system alternatives may be the most desirable, factors of cost and risk must be considered. "Maritime Security" denotes a need to enhance regional stability and security through cooperative interaction between our naval forces and those of the host nations. "Influence" highlights a humanitarian element to regional stability.

The problem statement also reflects our desire to attain quality, detailed information about these needs with a scoped, regional focus, rather than with a broad "brush-stroke" synopsis of stability issues worldwide. The Gulf of Guinea region, representing 13 countries from Liberia in the Northwest to Angola in the South, presents a host of challenges to stability, and is the perfect venue in which to test and evaluate the GFS concept on a regional scale. The lack of maritime capability to combat piracy and poaching, the epidemics, the floods, and the lack of infrastructure - among other issues - offer needs that may be translated into system requirements. Finally, though the year 2012 influences decisions in proposals for GFS system alternatives (obviously, new construction ventures are eliminated), it is intended as an aide to predicting the operating environment with reasonable certainty. It is not intended to eliminate future-concepts altogether.

Figure 2: Gulf of Guinea Region

Functional Area Analysis

FAA provides the first result of this study: a "GFS Process Model." Value Engineering concepts emphasize creative application of functional hierarchies while considering requirements set by the user - in this case, the people, governments, and naval forces of the Gulf of Guinea nations. We start by breaking the study into three separate study initiatives: Peacetime Engagement, Humanitarian Assistance/Disaster Relief (HA/DR), and Interagency & Non-Governmental Organization (NGO) Coordination. These sub-efforts address issues in the region via functional, mission, and capability hierarchies within their own respective missions. A "Country Team" - focused on detailed research into each country in the region - verifies these hierarchies, while providing the value base we desire. Out of these hierarchies, specific GFS capabilities are determined. We call these specific capabilities *attributes.*

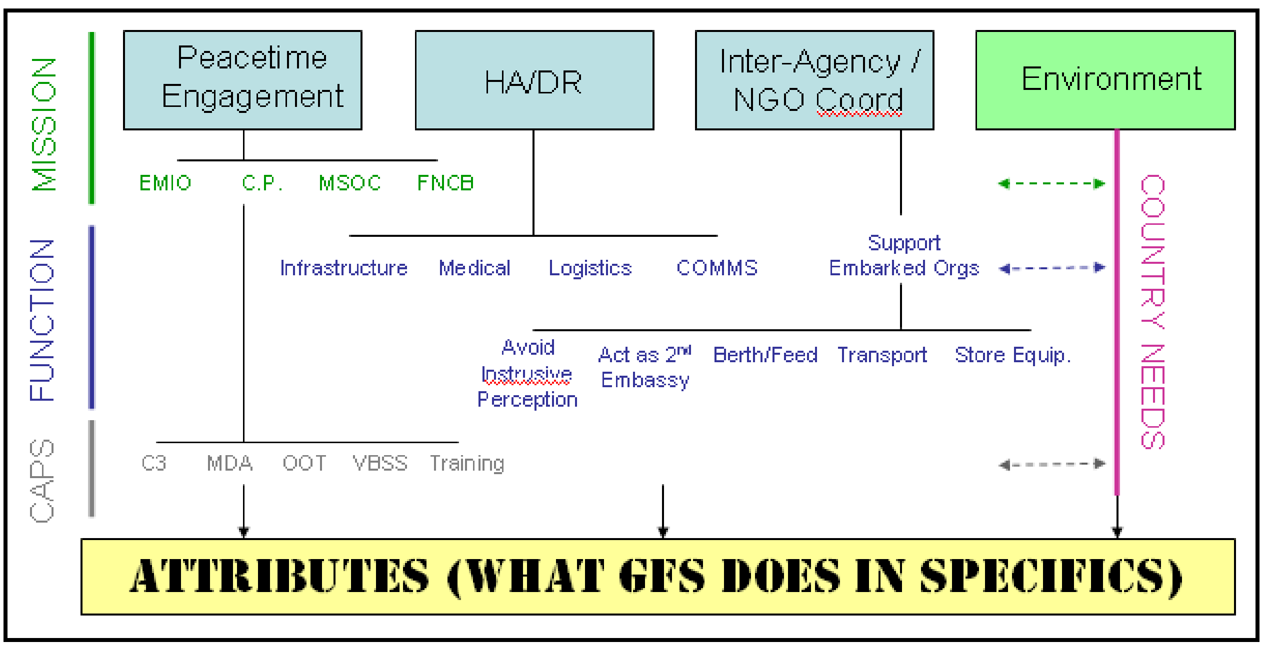

Figure 3: Functional Area Analysis

Viewing the mid-level hierarchies in Figure 3, one realizes that many of the capabilities and functions outlined for the Gulf of Guinea are endemic to the rest of the world. With some future study, other hierarchal elements specific to other regions may be added to our list; for example, perhaps a canal security function for Latin America (see

Figure 4). With such a comprehensive collection of mission hierarchies, a combatant commander could apply his or her own expertise of the regional geo-socio-political-economic environment (or employ a "country team" to do so) to this base model in order to determine their own region-specific attributes. This "GFS Process Model" possesses the potential to provide regional commanders with a process by which to determine what available assets might serve best as GFS in their geographical area of influence, and it represents the first result of our study.

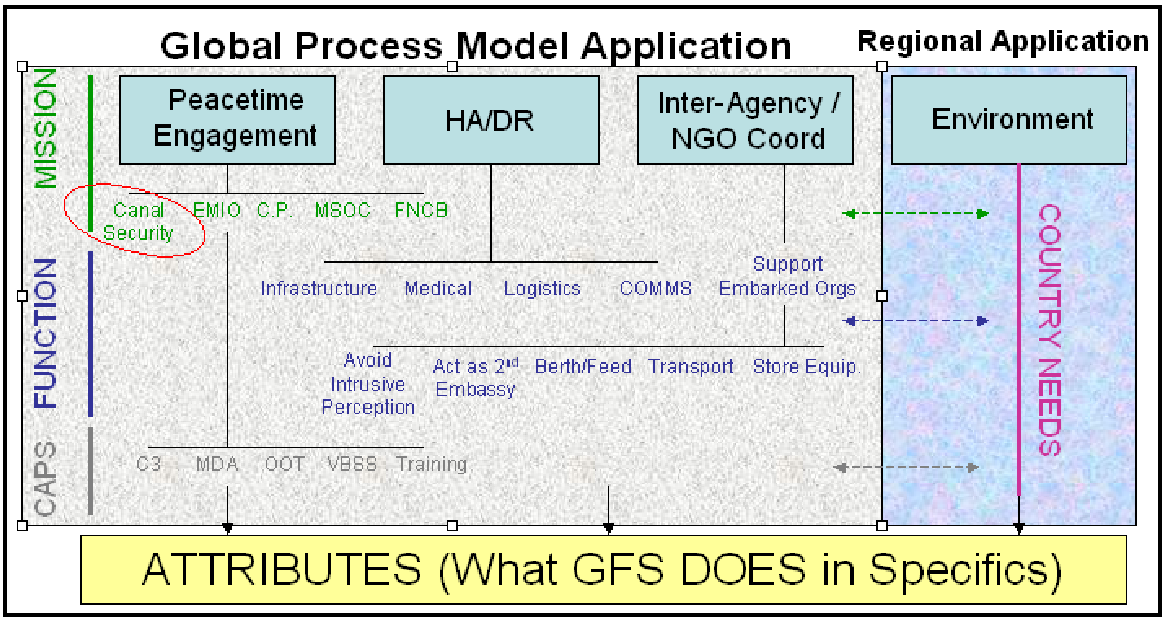

Figure 4: Global Process Model, with Regional Application

Attributes: Tying Non-Engineering Issues to Quantitative Methods

Our attributes warrant special attention, as they form the foundation for our next JCIDS phase, and they provide a means to derive quantitative and/or subjective measures by which to evaluate possible system alternatives. For example, in Peacetime Engagement, the requirement of a mid-level communication capability demands a more specific integration piece (attribute). Out of this attribute, one might logically assess scoring criteria such as whether or not a proposed GFS platform has a Local Area Network. Our attributes provide the means by which to gain specific, quantitative

requirements for GFS. They enable us to transfer from the qualitative world of regional stability into the quantitative world of engineering and analysis. Over 200 GFS attributes (including supporting attributes) are generated to help select the "best" alternative.

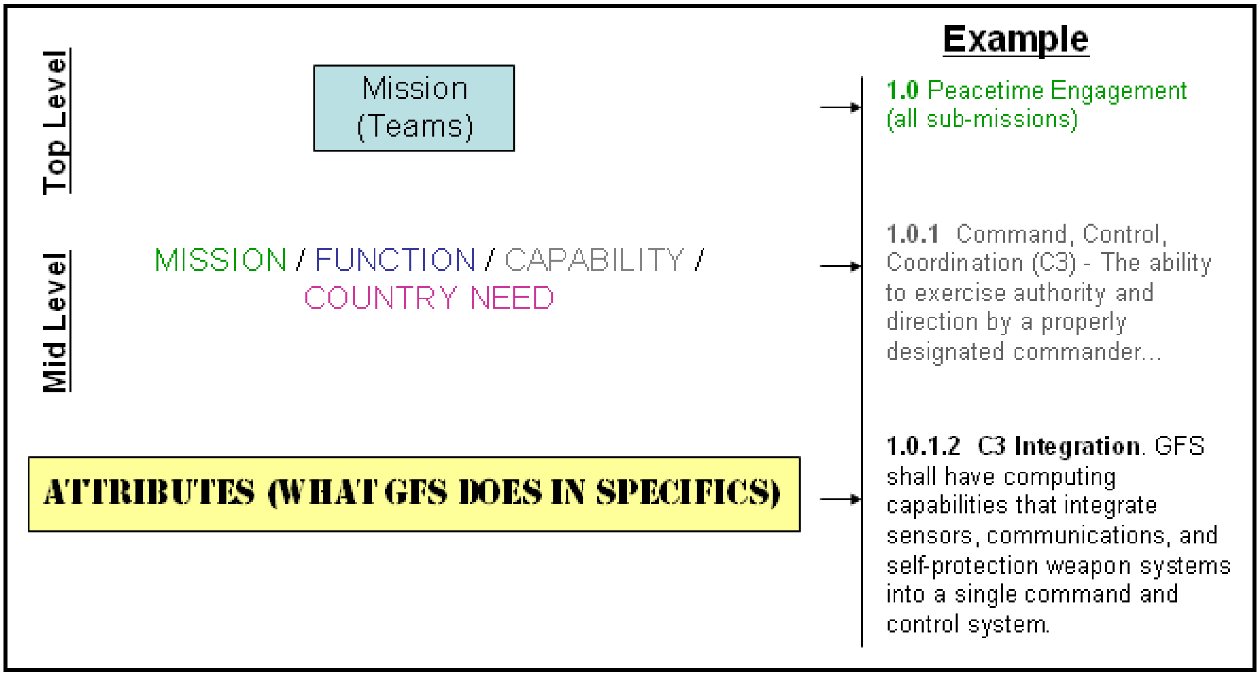

Figure 5: Attribute Definition and Example

Functional Needs Analysis

Having identified the needs, and converting them to measurable quantities via our attributes, we next seek to determine our current capability in meeting those requirements via FNA. Considering the maritime orientation of our definition, current capability consists of one type of asset: ships. A number of ships across a broad spectrum of categories might conceivably be called into service: Military Sealift Command (MSC) vessels, amphibious ships, Cruiser-Destroyer (CRU-DES) classes, or combinations of any of those. Testing those vessels' ability to fulfill the attributes via decision theory and a system of weighting and scoring within a scenario context for each mission comprise the major portion of our analysis in FNA, and in our study as a whole. Applying a decision matrix for "decisions made under assumed risk," we determine relative "expected value performance" (EVP) scores for each of our alternatives as a GFS in the Gulf of Guinea.

Our scenarios for each mission area offer a realistic context by which to evaluate GFS system alternatives, and are pertinent to stability in the region: a counter-piracy scenario for Peacetime Engagement, a flooding disaster for HA/DR, and a scenario centered around logistical support for NGOs combating the West African AIDS epidemic for our Interagency & NGO Coordination mission. Against these backdrops, the resulting top-performance ship alternatives include an LHD & FFG (large-deck amphibious/small CRU-DES) combination, an LPD-17 (San Antonio class), and a High Speed Vessel (HSV). These are our *best* assets out of current inventory; however, applying the mitigating factor of cost eliminates the LHD & FFG combination as a viable option, and maintains the LPD-17 and HSV as the top two *cost-effective* solutions, as they fall within the "bend in the knee" highlighted in the following figure.

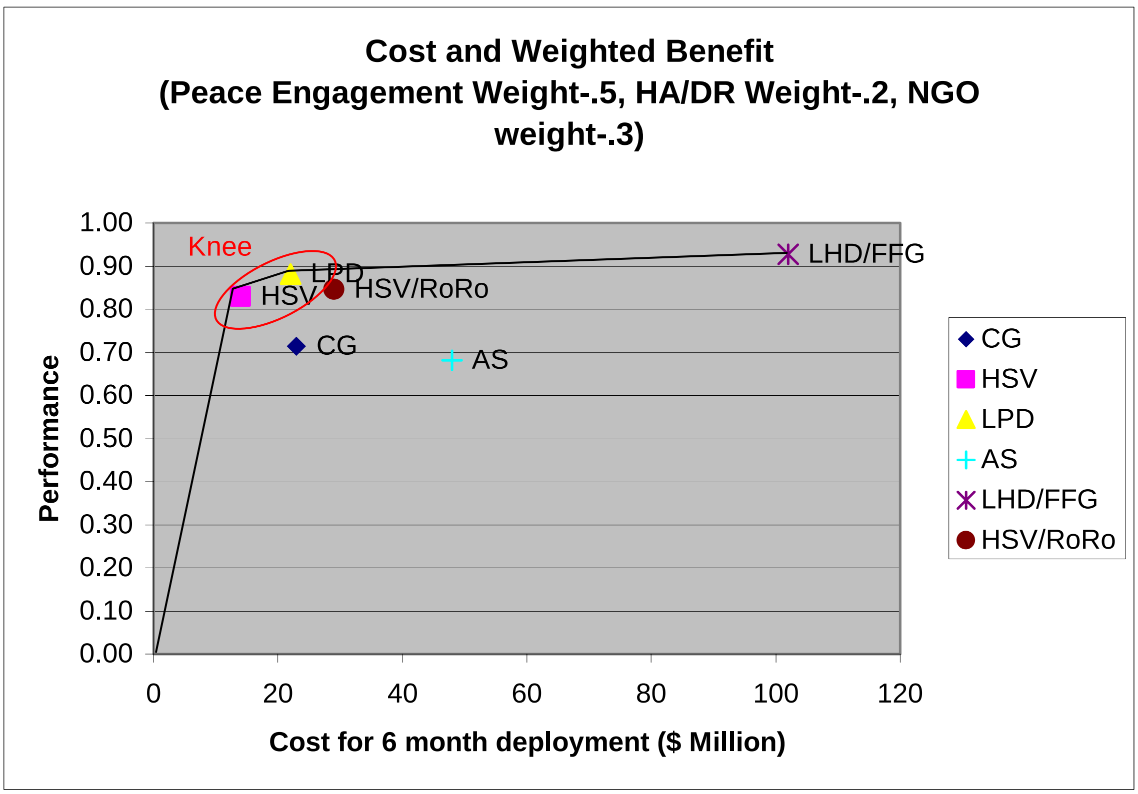

Figure 6: Cost Benefit Analysis

This conclusion is the second result of our study.

Risk Analysis

Cost is not the only mitigating factor in ship employment: risk must also be considered. Our first step in assessing risk associated with GFS is to *identify* potential issues, focusing on answering the question, "What IF something happens?" Understanding that many types of risk lie within categories such as cost, funding, management, political, production, and schedule, we may apply the expertise gained from our country studies - as well as from our own collective operational experience - in determining a set of risks to GFS in the Gulf of Guinea. One example of risk follows:

> *Operational Availability*: What if the operational availability of USN and USNS assets preclude use of the desired platform for the GFS mission for any number of reasons (Fleet Response Plan, number of desired class of platform limited in number, platforms called to respond to other operational requirements)?

After this is completed, the *probability* and *impact* of the risks can be combined and categorized into risk ratings (low, medium, and high) and prioritized. Our rankings are depicted below.

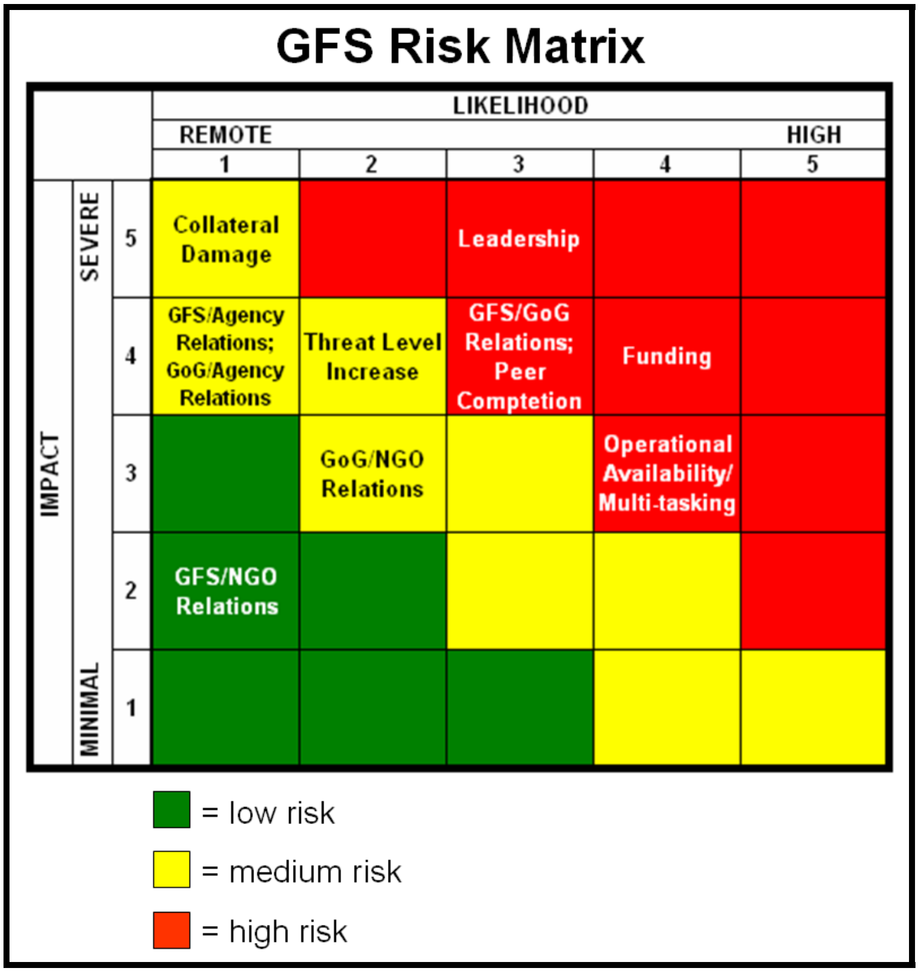

Figure 7: GFS Risk Matrix

Here, the risk of our operational availability example is among those that demand the greatest attention, as it comprises a high risk - or greater likelihood and/or impact. Such ratings may effect how we decide to handle the risk involved, whether it is to control it, avoid it, assume (accept) it, or transfer it. This decision culminates in a contingency action. In the case of our example, the preferred action is to transfer the mission to another ship platform - even if that vessel is less capable.

Our risk analysis does not shape or influence our rankings of GFS alternatives in this study; rather, it simply serves as a reminder that all decisions must be made with risks considered. Doing so leads to contingency actions to mitigate the risks involved with GFS in a variable environment.

This is not the end of our study, as the performance "gap" between the ship assets in our current inventory, and what is desired of them in their role as GFS, must be considered. In our study, our gap in attribute fulfillment is as great as 32% in the case of the AS. We must ask, "How can we close this gap for all ships that might be called to be the GFS?" In addition, the cost gap must also be considered.

Functional Solution Analysis

Performance and cost comprise the two variables upon which we may close "the gap" between current-capability and attribute requirements. Cost is addressed by simply considering maintenance and manning practices currently utilized by MSC ships, but specific details are not available in quantitative measures for this study. Regarding performance, two options are apparent: 1) design and produce a new GFS class of ship, or 2) make improvements to existing designs.

Though designing a new class of ship remains beyond the scope of this project, a study by the NAVSEA 05D1/NACT GFS Team provides some insights into notional specs. Evaluating this conceptual design under our system of scoring attributes, with the same weights assigned as for the alternatives tested in our FNA, yields respectable total value performance scores in each mission area. Overall performance ranks at 85% - ranked between the HSV (83%) and LPD-17 (88%) – our two most cost-effective choices. Considering that the NAVSEA team proposes complementing their "GFS Station Ship" with a Patrol Craft, their concept's EVP score increases to 87% - just one percentage point below that of our top cost-effective platform. Differences in opinion regarding certain attribute weights and scores between the SEA-12 and NAVSEA teams afford some perspective on why their notional design did not score even higher, as well as other considerations. Determining cost for the notional design, unfortunately, remains beyond the scope of our study, as R&D and production costs will most likely need to be considered.

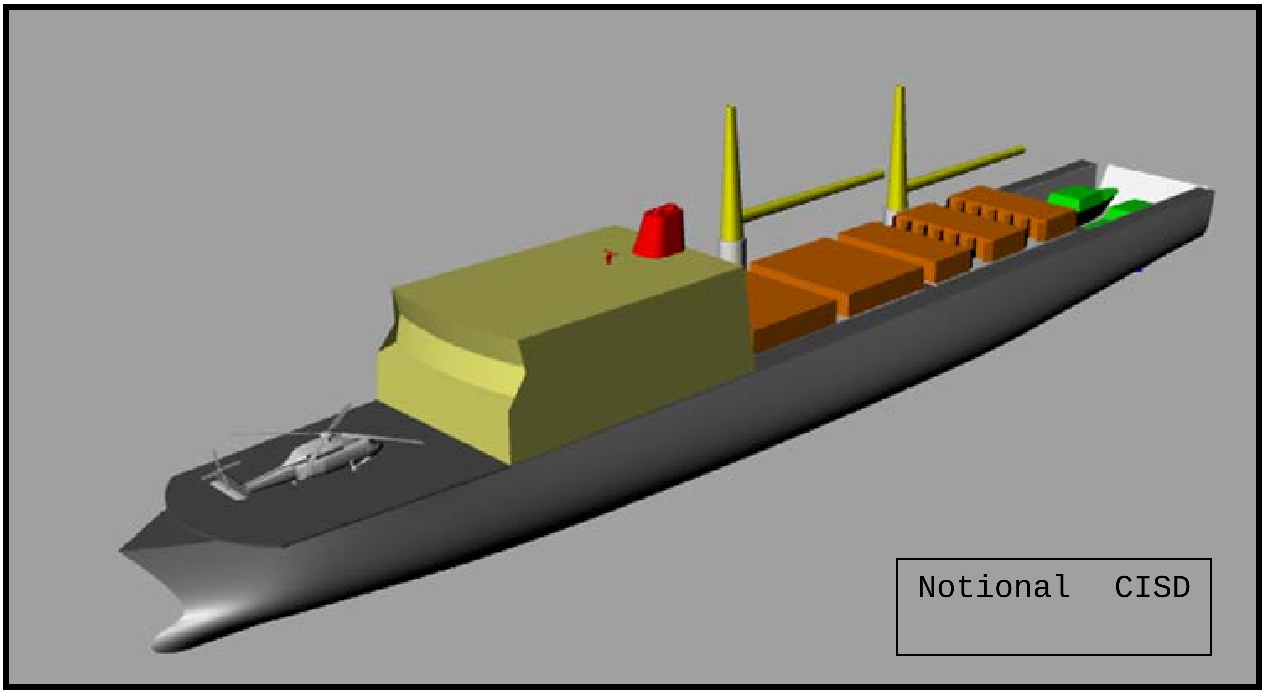

Figure 8: One of the CISD Notional Designs Developed for the NAVSEA GFS Team

Making materiel alterations, changing operating doctrines, or adjusting personnel assignments may also improve performance. Sometimes simple changes can influence performance scores greatly. We believe this to be the case with the AS alternative: by removing stanchions currently placed around its flight deck (thus enabling helicopter landing certification and use), as well as incorporating some communications improvements, its value as a GFS asset increases from 68% to 84%. Employing similar practices with other alternatives make the following performance enhancements possible:

	Old EVP	Change	New EVP
CG	.71	0	0.71
HSV	.83	↑.08	0.91
LPD	.88	↑.03	0.91
AS	.68	↑.16	0.84
LHD/FFG	.93	0	0.93
HSV/RoRo	.85	↑.06	0.91

Figure 9: Results of Doctrine, Materiel, and Personnel Changes

This assessment complements our risk analysis nicely, considering our risk example of operational availability. Should the LPD-17 and HSV not be available as GFS in the Gulf of Guinea, the AS suddenly becomes a viable alternative to *transfer* the role to.

Finally, we take the liberty to identify "scenario gaps," recognizing that the scenario focus of our FNA does not adequately address all possible GFS missions, such as fisheries enforcement. Exploring possibilities in U.S. Coast Guard integration and interaction, we realize that implementing such considerations will be important steps toward addressing roles that the Navy maritime component of our GFS is unfamiliar with. In addition, we recognize the value added by including coalition partners in the GFS mission - adding an element of persistence while also helping mitigate our *multi-ship* risk; however, we must approach such integration with caution, as political sensitivities exist in many Gulf of Guinea nations concerning former colonial rule by potential coalition partners.

Summary

Considering the desires of our leaders, understanding the needs of the people and governments of the Gulf of Guinea nations, quantifying those needs with measures called attributes, analyzing our Navy's current capability to fulfill these attributes in order to

determine the “gap” between what we can do and what we hope to achieve, and then closing that “gap” with cost and performance proposals summarizes our process. Though not the traditional approach to natural, social, political and economic threats to the stability and security of regions of the world, the analysis and organized process provided by our modified JCIDS engineering model offers tangible solutions and alternatives, and - perhaps even more importantly - a systematic, logical means of attaining solutions to complex regional issues.

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A. PROJECT ASSIGNMENT

In January of 2007, OPNAV N-81, Rear Admiral Dan Davenport, and his Deputy, Mr. Trip Barber, along with OPNAV N52, Rear Admiral Phil Greene, requested that NPS consider Global Fleet Station concepts, and design one as an integrated study within the larger umbrella of theater and security operations.[1] In February of 2007, the Wayne E. Meyer Institute of Systems Engineering assigned a study of the Global Fleet Station (GFS) to Systems Engineering and Analysis Cohort Twelve (SEA-12) as a campus-wide integrated project, with the following objectives:

> Design a system of systems and a concept of operations to implement the "Global Fleet Station" concept and to execute the missions of forward naval presence, crisis response, maritime security operations, security cooperation, civil military operations, counterinsurgency, counterterrorism, and counter-proliferation in a coalition, interagency and joint environment. Specifically, design a theater concept of operations for the Global Fleet Station for Commander, Naval Forces Southern Command focusing on the Caribbean, and [or] for Commander, Naval Forces Europe focusing on the Gulf of Guinea region. Consider current fleet structure and funded programs as the baseline system of systems to execute security and shaping missions in developing these concept of operations, then develop alternative architectures for platforms, manning, command and control, communication, and operational procedures to evaluate against the current program.[2]

Broad enough in its guidance, this assignment would lead SEA-12 on a journey not only to provide possible solutions to a concept, but also to try to define and scope the concept itself. Though promising a rewarding experience in the end, the road ahead to meeting the assignment requirements contained many challenges unique to the nature of

1. Jeffrey Kline, personal meeting with Dan Davenport and Phil Greene, January 17, 2007.

2. Frank Shoup, Wayne E. Meyer Institute of Systems Engineering Director (Ret.), memorandum to Systems Engineering Analysis Cohort 12, February 6, 2007, SEA-12 Capstone Project Objectives.

GFS. Realizing this nature, and determining a systems approach in which to properly address it, constituted a significant portion of the overall project in itself.

B. FIRST IMPRESSIONS AND INITIAL APPROACH

With such a vast array of missions, and spread beyond the familiar realm of our naval service across joint, interagency and coalition lines, we first considered our assignment as broad … and daunting. The break-down of our project assignment by the Wayne E. Meyer Institute of Systems Engineering, though providing clues on possible avenues of research with terms such as “civil military operations” and “theater concept of operations,” did not point directly to a detailed definition of a GFS, nor did it present a specific requirement to be solved. Though “alternative architectures” provided guidance as to what might become our end-product, its inclusion of manning, communications, and operational procedures did little to provide us with a scaled view of the end product. GFS, at this initial stage, seemed like an immense “black box” which would be required to do a lot of things … and our job was to “solve” it.

SEA-12’s first approach toward the Institute’s challenge touched only lightly on the “basics” of engineering and analysis, and might best be described as the BOGSAT method: a Bunch of Guys/Gals Sitting Around a Table. Following a generic research of literature concerning GFS, our group developed a general idea of concept trends and initial thinking on the topic, from the Department of the Navy to external agencies and entities. Following this immersion into the topic, we developed a “first look” list of needs and capabilities that a GFS should address. It follows:

- Justify Navy's role in Phase 0 operations
- Cooperation: joint, allied, coalition, interagency integration. high number of countries in a small area working closely together to enhance regional relationships. joint, coalition, civilian multinational participants in security operations worldwide.
- Expediency: A direct, succinct command chain required to efficiently and rapidly respond to crises anywhere in the world within a specified amount of time.

- Adaptability: to sustain and deploy flexible expeditionary force team packages with tailored teams and mission support modules. distributed operations offshore. to address a variety of developmental deficiencies regional Phase 0 operations...
- Theatre security cooperation
- Maritime interdiction of illegal transnational activities: counter piracy, law enforcement global maritime intelligence integration, regional maritime domain awareness leveraging international partners direct support of GWOT (surveillance, MIO, combat insertion) diplomacy, host NGOs and interagency reps crisis response
- Persistence: to sustain presence through a network of sea-based Fleet Stations worldwide. to establish a dependable forward presence through a steady-state self-sustaining sea station or sea base. to deploy expeditionary teams capable of addressing specific developmental deficiencies.
- Response to regional-specific disasters
- Train host-nation forces for Shaping and Stability Operations (SSO)
    - anti-terrorism
    - anti-piracy
    - Exclusive Economic Zone (EEZ) enforcement
    - civil-military relations
    - maritime security
- Provide regional node for information sharing
- Provide stability in unstable regions
- 1000 ship Navy; unified maritime operations
- complement/balance presence of peer competitors (China)
- Part of Global Maritime network
- Medical Outreach/Community Relations

- NEO
- Develop future CONOPS, optimal fleet organization and political
- interactions (ex: FAO) of the Navy.
- Secure strategic access and retain global freedom of actions
- Strengthen alliances and partnerships
- Establish favorable security positions
- Increase global maritime awareness
- Provide adaptable force packaging
- Inshore/riverine operations
- Forward Naval Presence
- Security Cooperation
- Counterinsurgency (COIN)
- Counterterrorism
- Civil-Military Operations
- Counter-proliferation
- Maritime Security Operations
- Crisis Response
- Deterrence
- Sea Control
- Air and Missile Defense
- Expeditionary Power Projection
- Reduce footprint ashore
- Address reduction of forward operating bases

This list, though long, redundant, and perhaps unfocused, represented a very important phase to our project: it was a start. It offered ideas about possible avenues of research focus. In addition, for such a broadly-based project assignment, our broad tactic of conducting general research was probably the best initial response. However, it still left us with only a vague idea of what GFS should be, as the list was very large.

With our first stab at the project came re-enforcement of our initial feelings about the unique nature of the GFS concept: namely, that the concept not only demanded answers as to what it should be, but also required that the right questions for those answers be developed. Indeed, some of these questions and guiding principles inherent to other systems challenges – such as specific definitions and problem statements – were vague or non-existent in the case of GFS. Not only would we have to "solve" GFS, we'd have to produce our own problem statement of what needed to be solved … in addition to our definition. To accomplish this, we needed to discover more about the background of GFS, who was asking for it, and why it was being called for. We had to "dig" deeper than our original literature search had taken us.

C. UNDERSTANDING THE BACKGROUND OF GFS

1. Globalization

Increased connectivity between the economies, social and cultural ideologies, and government regimes of the world's nations and peoples shape the environment in which they may prosper. Potential prosperity is threatened when this "global network" – or Globalization – is interrupted by instability in a region. The intensifying global competition for increasingly scarce energy resources, and instability in the traditional oil and gas supplier regions, is forcing consumer nations to look elsewhere for more reliable sources of energy. This search is creating new potential for conflict or cooperation in many parts of the world. As an important source of energy supplies, these regions may stand to benefit – or lose. Within these nations, economic disparities increase the potential for conflict and instability both within and across borders. The gap between the "haves" and the "have-nots," both within and between nations, invites the "have-nots" to resort to violence, corruption and crime. Unless the issues of the economic have-nots are addressed, the consequences will include greater global energy insecurity. Additionally, non-state threats are intensifying as increased global linkages among terrorism, transnational crime and militancy provide each with growing strength, while making it more difficult to isolate and attack individual targets. Conditions in various regions of the world are conducive to such interdependencies. In addition, as criminal elements

infiltrate legitimate political and economic society and blur the lines of distinction, it becomes necessary to counter this threat to stability through increased security and attention to the underlying social conditions.

2. New Challenges, and Calls for a More Distributed Navy

The world's increased connectivity presents new challenges, and potential missions, to our Navy. Indeed, our armed forces have already been thrown into some of them by the changing world dichotomy before they were entirely ready. Reconstruction and conflict prevention, disaster relief, and protecting the globalized economy, all address threats to regional stability and the global environment. Though not necessarily new missions in themselves, they are becoming increasingly important as functions of our nation's naval component.

The war in Iraq demonstrated the modern-world need to address social and civil issues in a campaign plan, beyond the realm of armed conflict. Referred to as reconstruction, this aspect of conducting a successful campaign has garnered much attention from our executive, legislative, department, and service branches as a necessary means for winning wars. More recently, some of the techniques of reconstruction are being considered for applicability toward regions susceptible to war, in order to prevent it. General Anthony Zinni (USMC – ret.) is one of the most outspoken proponents of such strategy:

> [he] highlighted the need to take a more holistic view of planning for conflict, particularly regarding the need for investment in conflict prevention. It's not enough to think only about stopping war or rebuilding after conflict, he argued. Preventing deadly violence from occurring requires significant resources, yet this investment saves much more in the long run.[3]

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3. Craig Cohen, Susanne Martike, and Anita Sharma, "Civil-Military Cooperation in a Time of Turmoil," *Woodrow Wilson International Center for Scholars*, http://www.wilsoncenter.org/index.cfm"fuseaction=events.event_summary&event_id=100140.

The U.S. Navy is one element of, and a means by which, reconstruction/conflict prevention may be executed.

The magnitude and number of catastrophic natural events in the past five years highlighted demands on our navy beyond the traditional scope of water supply or evacuation. At home, Hurricane Katrina's aftermath exposed a disparity in coordination between civil and military, federal and state, and government and non-government organizations. The 2004 Tsunami in the Indian Ocean revealed similar problems, but on an international scale. In each, the U.S. Navy responded admirably; however, operating in such austere environments - devoid of power and communications - naval vessels and aircraft found themselves as completely functional nodes of operation providing help, rather than as part of a complete, coherent response. Out this realm of disaster-relief, non-traditional capabilities were called for, such as inter-agency coordination and initial response preparedness.

Though the U.S. Navy has protected threats to trade since its inception, new threats to economic stability provide new challenges. Environmental threats such as fisheries depletion threaten the welfare of nation's people, who depend on their fish stocks as a source of protein, as well as to the export potential for the nations whose waters are exploited. Pirates, though a threat since the days of Blackbeard and the early 19th Century scuffles off of the Barbary Coast, now threaten the economic infrastructures of states – such as oil depots - in addition to their continuing threats to trade. Our nation and navy are now expected to answer the call of service to such threats, given their potential impact on the globalized economy.

3. The White Paper

Working as part of the CNO's staff, Captain Wayne Porter (USN) answered this call, and in so doing, coined the term "Global Fleet Station." Addressing the new global environment, as well as the need for *something* (a concept at that point) named GFS to "service" its regions, he went on to identify specific regions of interest. In his white paper to the CNO, he stated:

> The GFS concept is based on the establishment of a network of Fleet Stations worldwide, each one servicing a specific region and AOR ... Possible locations for these initial Global Fleet Stations include Guam or Singapore (GFS - SE Asia); Bahrain or UAE (GFS - East Africa, Arabian Gulf); Diego Garcia (GFS – South Asia); Rota (GFS - West Africa); and, Key West (GFS – South and Central America).[4]

Though never officially endorsed by the CNO himself (a second draft eventually was endorsed by the CNO's N3N5), Captain Porter's concept was not lost upon listening ears in Washington.

4. Differing Views

Admiral Mike Mullen, the CNO, did seize upon the GFS White Paper's initial concept, and adopted it within the strategic vision for his service. At the Naval War College in June of 2006, he referred to GFS as "a hub where all manner of joint, interagency, international organizations, navies, coast guards and non-governmental organizations could partner together as a force for good."[5] His description of bridging the gap between organizations certainly rang true to the calls of strategy reformists such as General Zinni, as well as to the realizations of the changing nature of the way in which our Navy needs to meet its new challenges. Indeed, in his 2006 Naval Operations Concept (NOC) and in a 2007 CNO's Guidance Letter, he refers to changes brought on by a globalized world. These documents discuss GFS in greater detail, as well, but the above quote seemed symbolic of his manner in describing what he hoped to achieve. What he meant by "force for good," our group believed an open-ended terminology to indicate his desire to receive multiple contributions to the concept, and to allow for competition among them.

The U.S. Southern Command (SOUTHCOM) described the CNO's desire for a GFS as "a highly visible, positively engaged, reassuring, and self-sustaining sea-base

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4. Wayne Porter, "White Paper on Global Fleet Station," March 20, 2006.

5. Mike Mullen, "Current Strategy Forum," remarks, Naval War College, Newport, RI, June 14, 2006.

from which to conduct regional operations, through tailored and adaptive packages."[6] One can identify the influence from Captain Porter's original White Paper, with its regional reference, but SOUTHCOM's inclusion of "tailored and adaptive packages" represents another possible aspect of what a GFS should be (this aspect is also covered in the NOC, signed by the CNO). SOUTHCOM put words into action with their implementation of the first pilot program under the GFS moniker, deploying HSV SWIFT just over a year after GFS was initially conceived.

Though the previous versions of GFS may seem sacred (given the source of the first, and given the timeliness of the second), others emerged. Commentators proposed that GFS take the form of small, autonomous land-based nodes of operation, citing facilities in Djibouti and Singapore as prime examples. Others went so far as to propose specific platforms and modes of operation in their description of what GFS should encompass. One analyst, in his report to Congress, suggested that GFS "might be built around a single amphibious ship or high-speed sealift ship,"[7] while a defense writer cited that GFS may consist of "…shallow draft Navy ships and support vessels to operate around rivers and littoral waters in key regions of the world."[8]

Discovering such varied concepts within a concept – from the CNO to operational commanders to reporters "on the beat" - our group realized that there was no specific, concrete, detailed requirement for GFS: nothing immediate for us to "sink our teeth into" as systems engineers. In addition, the CNO would not define the direction of our project, and given the challenge we interpreted from his quotes and documents, presume he wouldn't have it any other way. We would have to define GFS, determine our own requirements, and apply our systems knowledge as we knew how.

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6. U.S. Southern Command Partnerships for the Americas, "Global Fleet Station Pilot Deployment April - September 2007," U.S. Southern Command. http://www.southcom.mil/appssc/factFiles.php"id=9.

7. Ronald O'Rourke, "Navy Role in Global War on Terrorism (GWOT) - Background.

and Issues for Congress," *CRS Report for Congress*, (April 16, 2007): CRS-5.

8. Christopher J. Castelli, "Navy Admirals and Marine Generals Prepare for Annual Summit," *Inside Missile Defense* (2006), http://www.insidedefense.com/secure/defense_docnum.asp?f=defense_2002.ask&docnum=MISSILE-12-17-9.

5. Pilot Programs

We then decided to look for guidance from some programs already addressing it, identifying two GFS pilot deployments, along with three ship deployments closely affiliated through their "good will" nature. Some of these were fleet commander responses to the CNO's desire to "try a Global Fleet Station experiment in 'the next year or two.'"[9] One took place before the term "Global Fleet Station" was coined, performing many of the exact missions called for by the concept. Together, they further highlighted the various interpretations of GFS, spanning a broad platform and employment spectrum.

One GFS pilot took place during the process of researching and writing this report: Second Fleet's and SOUTHCOM's deployment of HSV SWIFT to Central American and Caribbean ports-of-call (April to September 2007). This deployment focused on port visits utilizing a high-speed, small-draft vessel which does not closely resemble what most would perceive as a U.S. Navy warship. SWIFT's visits to Panama, Nicaragua, Belize, Honduras, Guatemala, and the Dominican Republic fostered regional goodwill and cooperative engagement through training, teaching "courses ranging from vehicle and container inspection to small boat driving and basic seamanship skills."[10]

The next GFS pilot utilized a new type of platform vessel, along with an extended deployment schedule, to the Gulf of Guinea beginning in October of 2007. USS FORT MCHENRY, an amphibious Landing Ship Dock (LSD), affords greater storage capacity and greater ability to deploy smaller vessels from offshore, even if more limited by draft to enter ports than HSV SWIFT. Her eight months at sea and in West African ports were (are) intended to push the "persistent" nature of GFS referred to by the CNO. In addition, the inclusion of inter-agency, state-department, coast guard, non-government organization and host nation representatives in the planning of FORT MCHENRY's deployment at GFS Planning Conference in Washington D.C., distinguished this GFS pilot as the most credentialed in accordance with senior Navy guidance to date.

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9. Christopher P. Cavas, "U.S. Navy Chief Calls for New 'Maritime Strategy'," *Defense News* (June 15, 2006): 2.

10. Roxana Tiron, "Reaching Out: The U.S. Navy's global fleet station gets a trial run," *Sea Power*, (August 2007): 46.

The USS EMORY S. LAND – a submarine tender - deployed to West Africa in both 2005 and 2006. It has been touted retrospectively as the first GFS. Visiting countries in the Gulf of Guinea including Ghana, Sao Tome and Principe, Nigeria, Gabon, Angola, Togo, and Cameroon, EMORY S. LAND's mission in the GoG was to help African nations boost their maritime security, as well as to forge stronger alliances with them. Her mission encompassed many tasks now referred to as GFS attributes: performing humanitarian aid, training West African forces in security and anti-terrorism techniques, HIV-AIDs prevention and awareness efforts, and search-and-rescue training.

Other deployments, by the nature of their missions, affiliate closely with the pilot programs. USNS COMFORT and USS PELELIU both conducted four-month regional visits in 2007, with focuses on "humanitarian assistance, training and community relations activities."[11] COMFORT visited twelve Central American nations, while PELELIU deployed to the Western Pacific. Both embarked representatives "from various non-governmental and aid agencies,"[12] with a heavy emphasis on medical professionals in the case of COMFORT.

11. U.S. Office of Chief of Naval Operations Public Affairs, "Humanitarian Missions Essential to Relationships, Global War on Terrorism," *Navy.mil* (2007), http://www.news.navy.mil/search/display.asp?story_id=30119.

12. U.S. Office of Chief of Naval Operations Public Affairs, "Humanitarian Missions Essential to Relationships, Global War on Terrorism," *Navy.mil* (2007), http://www.news.navy.mil/search/display.asp?story_id=30119.

Figure 10: GFS "Pilots"

These pilot programs, whether operating as a GFS pilot or in loose affiliation with it due to their missions, re-enforced for our group the realization that GFS had no single direction: large deck amphibious ship vs. hospital ship vs. small and fast, shallow draft vessel; persistence vs. short stay; or emphases on medical aid vs. military training. However, we did recognize common threads: good will, engagement, inter-agency involvement, and regional scopes. Perhaps the largest realization for us with these programs was that they were reactions by fleet commanders to the CNO's desire for a GFS - offering the promise of providing lessons-learned and regional insights to us - but not necessarily providing us with a template to follow in our own struggle to determine what a GFS should be.

II. TAKING CHARGE: A DELIBERATE APPROACH TO GFS

"Leaders are those who know what to do next, know why that is important, and know what appropriate resources to bring to bear on the problem at hand. Then, through effective communication they influence others to follow." [13]

- Barry Bowater

SEA-12's literature research and efforts to address GFS led us to a general understanding of what GFS should be, but that there was no single, specific solution. A changing, globalized world confronted our navy with new missions. The GFS concept is a response to this change. Senior Navy leadership often described GFS in broad terms. Fleet Commanders and analysts responded with their own ad hoc solutions, experimental in nature. They are so varied that we realized that they were also struggling with the same dilemma that we faced: grasping onto what GFS should be and finding a solution to what it was attempting to address.

We were on our own.

We decided to take charge, and produce a deliberate approach to GFS. This would consist of defining GFS based on our research to date and on a more thorough review of our strategic guidance, scoping it as a workable project in the time we had, determining a problem statement, and then selecting a systems engineering process that would yield GFS solutions as the product of orderly and systematic deliberations as the first GFS proposal based off of a systems engineering approach.

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13. John Ben Shepperd Public Leadership Institute, "Quotes: Leadership," http://www.utpb.edu/JBS/quotes.htm.

A. DEFINING GFS

Based on our general understanding of GFS, and borrowing heavily from two documents that we considered as pivotal to its direction – the GFS White Paper and the NOC – we defined GFS as follows:

> **A sea base of operations from which to coordinate and launch a variety of missions within a regional area of interest, focusing primarily on Phase 0/Shaping and Stability operations, to include Theater Security Cooperation, Maritime Domain Awareness, and tasks associated with the war on terror.**

The following expand on the definition's key phrases:

- *Sea Base*: This is meant partly as a means of scoping, as well as to demonstrate our understanding of the GFS program as part of a broader strategy. By "sea base," we clearly desire to scope it to concepts or platforms which emanate from the sea. With limited exception, our research led us to conclude that those who best articulated and understood the needs for a GFS clearly envisioned it as being sea-borne. Though land-borne stations should not be excluded, necessarily, focusing on a maritime base helped us scope our project to workable size, and it seemed like a logical choice. In addition, the term "sea base" is not intended to infer that GFS is the answer to the Navy's larger Sea Basing concept; however, it does infer that it may fall under it.
- *Regional Area of Interest*: From initial concept to the pilot programs, a regional aspect to GFS remains a common thread. Focusing on a specific region would help us do two things: scope and attain a value base. Obviously, by scoping to one region of the world vice the entire globe, we again scaled our project to a more

manageable task. Perhaps more important, however, was our desire to offer genuine solutions to the particular needs of specific regions, rather than merely offering a world-generic brush-stroke of cooperation and engagement that may not apply at the regional level. Beyond scoping, this regional aspect would afford a value-base to our systems engineering approach.

- "*Phase 0/Shaping and Stability operations, to include Theater Security Cooperation, Maritime Domain Awareness, and tasks associated with the war on terror*:" The traditional four phases of a military campaign identified in joint publications are deter/engage, seize initiative, decisive operations, and transition. Phase Zero encompasses all activities prior to the beginning of Phase I – that is, everything that can be done to prevent conflicts from developing in the first place. Executed properly, Phase Zero consists of shaping operations that are continuous and adaptive. Its goal is to promote stability and peace by building capacity in partner nations to be cooperative, trained, and prepared to help prevent or limit conflicts. For the United States, this approach is typically non-kinetic and places heavy emphasis on interagency support and coordination. In many instances, Phase Zero involves a strategy in which the Department of Defense (DoD) is not the lead agency and its programs are only one part of the larger U.S. Government effort. The exact origin of the Phase Zero reference is unclear, making it difficult to give credit for its coining.[14] This section of our definition is intended to express the need to give ourselves enough leeway to scope further through a true systems process, rather than by jumping to conclusions early without thorough research.

14. Charles F. Wald, "New Thinking at USEUCOM: The Phase Zero Campaign," *Joint Forces Quarterly* (2006): 48.

This definition has served as general guidance and has provided some boundaries, while not eliminating possibilities. It was our first concrete milestone toward achieving a GFS solution.

B. SELECTING A REGION: THE GULF OF GUINEA

Selecting a region for focused study may seem strange given the "global" label of the system alternative we intended to propose; however, we believed a regional (vice global) focus would allow us to address core socio-political-economic engagement issues through real understanding of individual country needs. A global approach simply would not afford such intimate knowledge and understanding, and we feared that such an approach would only offer "brush-stroke" solutions to broad global issues. Our regional focus received validation via the release October 2007 release of *A Cooperative Strategy for 21st Century Seapower* – a joint document signed by all naval service chiefs – which stated the following: "Our maritime forces will be tailored to meet the unique and evolving requirements particular to each geographic region."[15] In addition, a regional approach afforded a means by which to scope our project, providing another set of boundaries within to work.

The Gulf of Guinea is the best regional focus for GFS, as it possesses a broad array of socio-economic, socio-political, political-economic, security, and general stability issues among diverse nations. We specified 13 countries, starting from Liberia in the Northwest to Angola in the South. Some of these nations are in transitional phases as they attempt to control and manage the intertwining web of immense resource profits, changing governments, securing their borders and maritime domains, and taking care of their people: issues that can rapidly devolve to war, instability and insecurity, or possibly terror, if they spin out of control. The United States also has a vested interest in the region, as its vast oceans encompass trade routes, and it relies more heavily on it as a trading partner.

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15. U.S. Department of the Navy and U.S. Coast Guard, *A Cooperative Strategy for 21st Century Seapower* (Washington, DC: GPO, 2007): 10.

Figure 11: Gulf of Guinea Region

We also selected the Gulf of Guinea region due to the experience already attained in the region by our Navy through its pilot programs (EMORY S. LAND and FORT MCHENRY), and also due to access to resources on Africa within our own campus, consisting primarily of research efforts underway in the NPS National Security Affairs (NSA) department, as well as foreign-national NPS students from the Gulf of Guinea region.

C. PROBLEM STATEMENT

We then constructed the following problem statement:

Evaluate Global Fleet Station system alternatives to provide the most effective solution to execute Maritime Security and Influence Operations in the Gulf of Guinea, projected to 2012.

Again, we expand on certain phrases:

- *System Alternatives*: This is meant to emphasize our systems engineering approach to GFS – a holistic approach, and the first of its kind attempted. It is also indicates what we have provided. A system might be a single platform, or several platforms with "systems of systems" involved, to include the means of integrating forces.
- *Most Effective*: In an ideal world where mitigating factors such as cost and risk did not influence decision making, we would strive to develop or propose the "best" system alternatives to complete the GFS mission. By the same token, to select a platform or concept for GFS based purely on "efficiency" might endanger our focus on providing value to shaping and stability in the region by minimizing – or how well we accomplish the mission. We used the term "most effective" to delineate an acceptable value somewhere between our best capability, and our cheapest.
- *Maritime Security*: "Maritime security is required to ensure freedom of the seas; facilitate freedom of navigation and commerce; advance prosperity and freedom; and protect the

resources of the ocean."[16] This term was intended to convey the need for a military aspect to GFS: an ability to work with host nations' service components to help them achieve stability within their borders.

- *Influence*: "The power of producing effects without obvious exertion of force or direct exercise of command. It requires the creation of secure and stable environments that nurture enduring relationships and interdependencies."[17] This term was intended to convey the need for a civilian counterpart to the military aspect of GFS, which would address shaping and stability considerations beyond the realm of host nations' military forces, but to the heart of issues – whether it be aid to the governments, populations, or businesses of West Africa.
- *2012*: Setting a timeframe had more to due with our ability to specify the operating environment of the Gulf of Guinea, rather than with a desire to limit options. By projecting five years out, we can use today's conditions for our scenarios and simulations. By contrast, projecting the state of Gulf of Guinea socio-economic-political affairs twenty years out is a dilemma. We know that a five year timeline implies limited solutions, negating future-concept solutions; however, this is not our intention. We will consider all system alternatives in the end, whether future or current … but they will be based on the current operating environment.

16. U.S. Department of Defense and Homeland Security, *The National Strategy for Maritime Security*, (Washington, DC: GPO, 2005): 2.

17. U.S. Office of Chief of Naval Operations Strategic Studies Group XXIV, "Beyond Maritime Supremacy: Balancing Maritime Capabilities for the Age of Unrestricted Warfare," (Washington, DC: GPO, 2006): 4-3.

D. OUR SYSTEMS ENGINEERING PROCESS

The means by which SEA-12 decided to discover these system alternatives – and the means by which we intended to tie a largely strategic and policy-related topic to systems engineering and analysis – led to our adoption of the Joint Capabilities Integration and Development System (JCIDS) process. As a systems process, it was initially predicated on insuring that war-fighters receive the capabilities to successfully execute their mission, and in that sense, is often referred to as a Capabilities Based Approach (CBA). We selected it for two primary reasons: a basic framework and easy flow within which we could apply our systems engineering knowledge, and the fact that it is an understood method within the Department of Defense.

Figure 12 outlines the JCIDS process, and provides great reference for detailed insights into its steps:

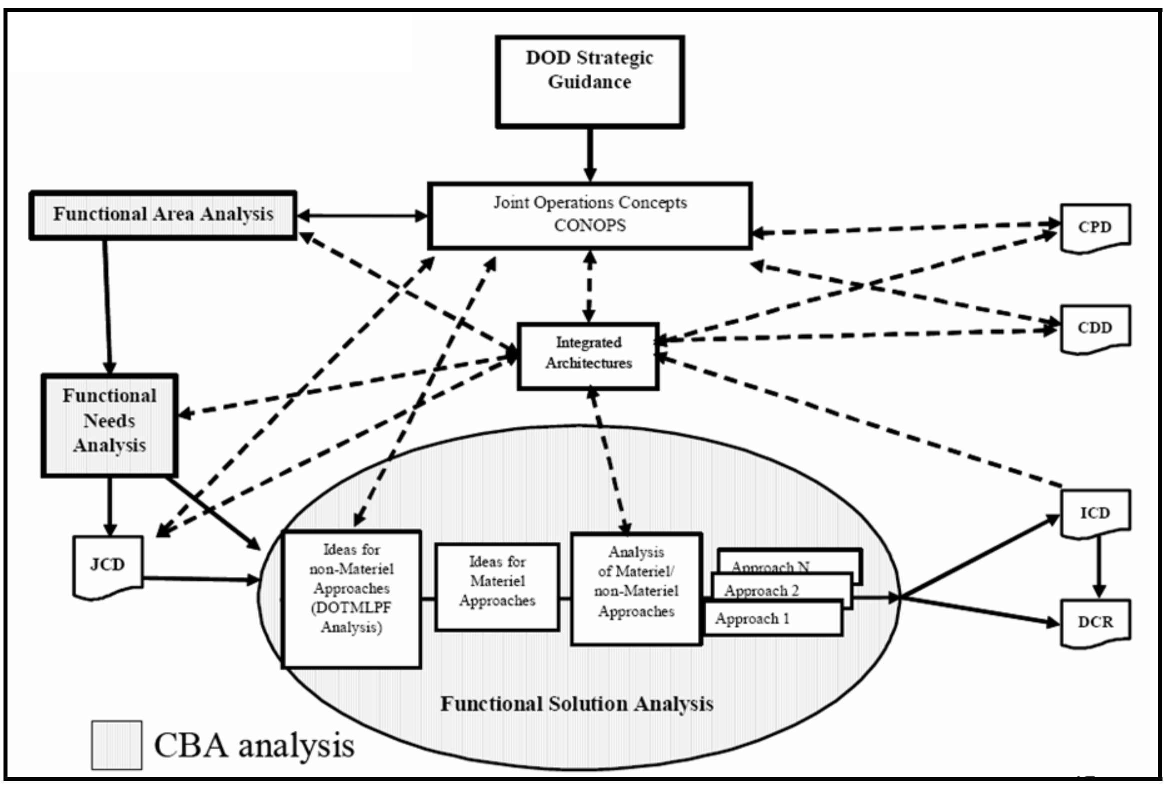

Figure 12: JCIDS Process[18]

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18. U.S. Office of the Chairman of Joint Chiefs of Staff, *Operation of the Joint Capabilities Integration and Development System* (CJCSM 3170.01C) (Washington, DC: GPO, 2007): A-3.

A more basic model offered three simple steps by which to apportion our project (see Figure 13): Functional Area Analysis (FAA), Functional Needs Analysis (FNA), and Functional Solutions Analysis (FSA).

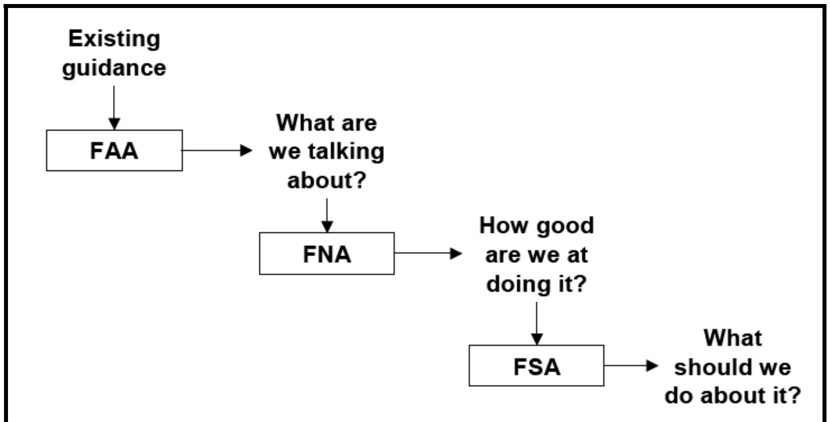

Figure 3. Simplified diagram of major CBA inputs, analyses, and outputs.

Figure 13: Three Steps of a CBA[19]

- Step 1: Functional Area Analysis – Identify relevant strategic guidance, and then "synthesize existing guidance to specify the military problems to be studied."[20]
- Step 2: Functional Needs Analysis – often referred to as Gap Analysis – "examines that problem, assesses how well the DoD can address the problem given its current program, and recommends needs the navy should address."[21]

[19] U.S. Office of the Chairman of Joint Chiefs of Staff, *Capabilities-Based Assessment (CBA) User's Guide (Version 2). Force Structure, Resources, and Assessments Directorate (JCS J-8)*, (Washington, DC: GPO: 2006): 7.

[20]. U.S. Office of the Chairman of Joint Chiefs of Staff, *Capabilities-Based Assessment (CBA) User's Guide (Version 2). Force Structure, Resources, and Assessments Directorate (JCS J-8)*, (Washington, DC: GPO: 2006): 7-11.

[21]. U.S. Office of the Chairman of Joint Chiefs of Staff, *Capabilities-Based Assessment (CBA) User's Guide (Version 2). Force Structure, Resources, and Assessments Directorate (JCS J-8)*, (Washington, DC: GPO: 2006): 7.

- Step 3: Functional Solutions Analysis – what we sometimes refer to as our Analysis of Alternatives – takes the FNA "assessment as input, and generates recommendations for solutions to the needs."[22]

SEA-12 modified this process slightly to produce our own guidance from the JCIDS construct, summarized in Figure 14.

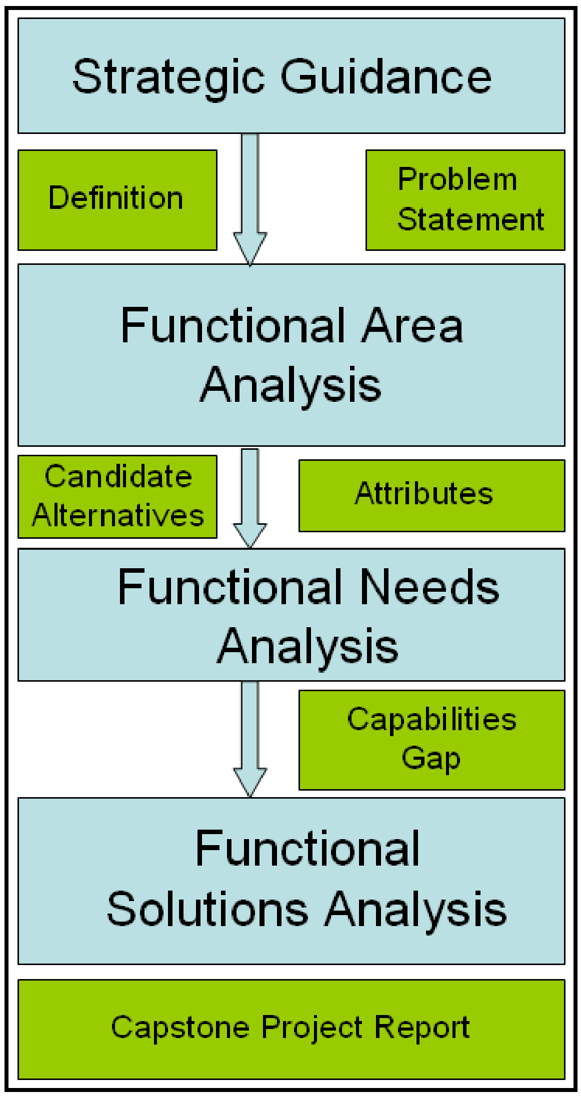

Figure 14: SEA-12 JCIDS Approach

22. U.S. Office of the Chairman of Joint Chiefs of Staff, *Capabilities-Based Assessment (CBA) User's Guide (Version 2). Force Structure, Resources, and Assessments Directorate (JCS J-8)*, (Washington, DC: GPO: 2006): 7.

Included are three primary steps to a CBA: FAA, FNA, and FSA. Our outcome consisted of this report, rather than a Joint Capabilities Document (JCD). In addition, determined not to restrict ourselves by following the strict guidelines of any single process, or feeling obligated to hit every minute detail of a JCIDS template such as that of Figure 12, we had already realized the importance of avoiding such constraints due to the dynamic nature of our subject.

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III. STRATEGIC GUIDANCE

A. INTRODUCTION

Though falling within FAA under the CBA User's Guide construct, Strategic Guidance serves as a reference throughout all phases of the JCIDS process; therefore, we applied it to our project as its own distinct phase as part of *our* modified process. This phase of our research actually commenced on "day one" of our project assignment with our initial literature search, so our major task included attaining better depth-of-understanding of the strategic documents we had already researched, as well as some that we may have missed. The intent of re-focusing on senior guidance was to verify the legitimacy of our definition and problem statement, and apply changes where appropriate. In addition, this phase helped us better understand *why* GFS was being called for, even if some of the documents had not, as of yet, mentioned the concept directly.

B. LEVELS OF GUIDANCE

Following a framework set forth by the CBA User's Guide (see Figure 15), we sought guidance from the national (executive), department, and service levels.

Figure 5. Relationships of Key Strategic Documents.

Figure 15: Levels of Strategic Guidance[23]

1. National

Beyond specific directives issued by the President, two documents comprise the over-arching framework for executive level guidance to naval forces: the National Security Strategy (NSS) and the National Strategy for Maritime Security (NSMS).

a. The National Security Strategy

The NSS outlines the executive strategic vision. Of note were several references to the ideals of freedom of people and of trade, providing the foundations for democracy via economic prosperity – and vice versa – and strengthening alliances. "The goal of our statecraft is to help create a world of democratic, well-governed states that can meet the needs of their citizens and conduct themselves responsibly in the

23. U.S. Office of the Chairman of Joint Chiefs of Staff, *Capabilities-Based Assessment (CBA) User's Guide (Version 2). Force Structure, Resources, and Assessments Directorate (JCS J-8)*, (Washington, DC: GPO: 2006): 12.

international system."[24] Though such statements may seem broad in nature, they certainly set a vision for the over-arching goals that our executive intends to achieve globally – region by region - and for which GFS will work to enable.

The 2006 NSS does not, however, merely proclaim glorious and inspiring ideals; it does, in fact, provide more specific direction. Some of its chapters deal directly with defusing regional conflicts, fighting terrorism, confronting the challenges of globalization, and spurring free-markets and infrastructures which will, in turn, enable democracy to flourish. Such topics are applicable to GFS. For instance, in describing the challenges in Africa, the NSS states the following:

> Africa's potential has in the past been held hostage by the bitter legacy of colonial misrule and bad choices by some African leaders. The United States recognizes that our security depends on partnering with Africans to strengthen fragile and failing states and bring ungoverned areas under the control of effective democracies … overcoming [these challenges] requires partnership, not paternalism.[25]

This certainly does seem a more specific – and relevant – to our regional application of GFS. "Partnership, not paternalism" – the strength of this statement alone might influence what we would determine as the most effective system alternative, perhaps steering us toward a system with non-imposing characteristics. At the very least, it set the stage for an emphasis on the topic of cooperative engagements in the department and service documents that followed.

b. National Strategy for Maritime Security

The President's NSMS links these ideals that associate freedom with stable economies to the maritime domain. It fully recognizes that extending stability beyond nations' shores remains vital to fostering regional and world stability: "The

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24. Executive Office of the President of the United States, *The National Security Strategy of the United States of America* (Washington, DC: GPO, 2006): 1.

25. Executive Office of the President of the United States, *The National Security Strategy of the United States of America* (Washington, DC: GPO, 2006): 37.

safety and economic security of the United States depend in substantial part upon the secure use of the world's oceans."[26] Two of three of the NSMS's broad principles reinforce this link, stating that "preserving the freedom of the seas is a top national priority … [and that] the United States government must facilitate and defend commerce to ensure this uninterrupted flow of shipping."[27] Out of this document, we deciphered several influences and characteristics for what we would define and choose for GFS: an orientation toward the sea, security of sea-lanes and territorial waters, international engagement, and enhancing Maritime Domain Awareness (MDA).

2. Department

Exceptional guidance was gleaned from the direction, recommendations to Congress, and philosophy promulgated by the Secretary of Defense's Quadrennial Defense Review (QDR) of 2006. It continues several of the dominant themes from the NSS, and offers more detailed direction in their implementation.

Some of the themes included within the QDR, along with commentary on possible applications to GFS, follow:

- *Humanitarian Assistance*: Citing lessons and achievements from the 2004 tsunami, and crisis responses in Liberia and Haiti, the QDR identifies two direct benefits of military involvement in humanitarian efforts: "By alleviating the suffering and dealing with crises in their early stages, U.S. forces help prevent disorder from spiraling into wider conflict or crisis. They also demonstrate the goodwill and compassion of the United States."[28] The former benefit applies directly to stabilization of a globalized world, in an effort to dissuade war. Some might contend that this is in fact the primary role of GFS: to prevent conflict.

26. Executive Office of the President of the United States, *The National Strategy for Maritime Security* (Washington, DC: GPO, 2005): 1.

27. Executive Office of the President of the United States, *The National Strategy for Maritime Security* (Washington, DC: GPO, 2005): 7.

28. U.S. Office of the Secretary of Defense, *Quadrennial Defense Review Report* (Washington, DC: GPO, 2006): 12.

- *Regional Focus*: Though broad capabilities of our military are not necessarily discouraged in the QDR, great emphasis is placed on the details of regions. "Highly distributed global operations over the past several years … make manifest the importance of small teams conducting missions uniquely tailored to local conditions."[29] Indeed, to address the very interactive nature of humanitarian missions, GFS may need to be regionally – vice globally – tailored in order to provide genuine assistance.
- *Shaping*: Four pages of the QDR are dedicated to the topic of "shaping the choices of countries at strategic crossroads," and it proposes doing so by shaping "these choices in ways that foster cooperation and mutual security interests."[30] This topic dovetails nicely with the President's emphasis on partnership, vice paternalism, in working with nations to foster regional stability. It offers capability requirements to meet the challenges of shaping nations' decisions, such as demanding improved language skills and cultural awareness, persistent surveillance, rapid deployment, and secure communications – all of which might play into specific platform requirements for GFS. Perhaps more importantly, however, this QDR topic provides a strategic role under which to determine GFS missions.
- *Joint, Interagency, NGO, and International Integration*: Regarding more traditional joint efforts in the maritime domain, the QDR demands a fully integrated Coast Guard and Navy.[31] It also proclaims a new joint aspect toward supporting the NSS: "Interagency and international combined operations truly are the new Joint operations."[32] As part of this new focus,

29. U.S. Office of the Secretary of Defense, *Quadrennial Defense Review Report* (Washington, DC: GPO, 2006): 14.

30. U.S. Office of the Secretary of Defense, *Quadrennial Defense Review Report* (Washington, DC: GPO, 2006): 28.

31. U.S. Office of the Secretary of Defense, *Quadrennial Defense Review Report* (Washington, DC: GPO, 2006): 47.

32. U.S. Office of the Secretary of Defense, *Quadrennial Defense Review Report* (Washington, DC: GPO, 2006): 83.

> the QDR emphasizes working with NGOs and non-military entities, including the Department of State's Coordinator for Reconstruction and Stability (S/CRS). Such an approach marks not only a "continuing shift … from Department-centric approaches to interagency solutions,"[33] but also highlights a major paradigm shift in the Department's view of the missions that these interagency entities specialize in, issuing guidance "in 2005 to place stability operations on par with major combat operations within the department."[34] Consideration of this latter point is critical guidance. When attempting to determine missions and capabilities for GFS, one concern is that naval officers and decision-makers involved in the process will find the temptation to return to the traditional methods of meeting challenges with the "business end" of a 5-inch gun. The QDR's guidance dissuades such temptation, serving as a reminder of what was important, and what we were attempting to achieve with GFS.

Placing stability operations on par with combat operations, the QDR solidifies our nation's need for a military response – coordinated with non-military entities and specialists – to non-traditional missions with emphases on partnerships and cooperative engagements with the populations and governments of nations. The hope is that such a coordinated effort will prevent conflict.

3. Service

Taking the maritime influence of national guidance as set forth by the NSMS into consideration, as well as the interagency emphasis of the QDR, we sought guidance from *all* three maritime services. The two primary documents outlining each service's strategy are the Naval Operations Concept (NOC), signed by the CNO and the Commandant of the Marine Corps, and the U.S. Coast Guard Strategy for Maritime Safety, Security, and

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33. U.S. Office of the Secretary of Defense, *Quadrennial Defense Review Report* (Washington, DC: GPO, 2006): 84.

34. U.S. Office fo the Secretary of Defense, *Quadrennial Defense Review Report* (Washington, DC: GPO, 2006): 86.

Stewardship, signed by the Commandant of the Coast Guard. We also sought direction from the CNO's Guidance Letter of February, 2007.

a. Naval Operations Concept

The NOC makes specific reference to GFS, offering what we considered to be solid direction into what we should consider as important in our definition of it.

> GFS is a persistent sea base of operations from which to coordinate and employ adaptive force packages within a regional area of interest. Focusing primarily on Phase 0 (shaping) operations … GFS offers a means to increase regional maritime security through the cooperative efforts of joint, inter-agency, and multinational partners, as well as Non-Governmental Organizations.[35]

This quote affirmed several themes from our national and department level guidance: sea base, regional focus, shaping operations, and joint/interagency/international cooperation. Beyond the direct reference to GFS, the NOC recognizes the impact of regional stability on global systems. It also outlines thirteen naval missions, most of which have direct or indirect applicability to GFS missions, to include Crisis Response, Civil-Military Operations, and Maritime Security Operations. This important document not only provided affirmation of the role of GFS in naval endeavors around the world, but with its mission focus, it also provided our group with an insight into a possible method by which to approach our project (I.E. by missions).

b. U.S. Coast Guard Strategy

The U.S. Coast Guard Strategy provides enlightening insights into a host of non-traditional missions and ways of conducting business on the high seas, as these non-combat roles have been relegated to the Coast Guard in the past. Suddenly, these missions are now gaining importance with the Coast Guards sister service, as the Navy now confronts challenges such as fisheries enforcement, EEZ resource management,

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[35]. U.S. Department of the Navy, *Naval Operations Concept* (Washington, DC: GPO, 2006): 30.

regime building, and maritime governance with its GFS. Indeed, the Coast Guard seems well ahead of the Navy in several of the roles GFS is intended to fill:

> The Coast Guard's military, law enforcement, and humanitarian functions – all blended into a single maritime force – closely resemble those of the vast majority of the world's navies and coast guards in terms of structure, capabilities, and missions … [In addition] the Coast Guard has a long history of providing international training to maritime forces around the world, improving the capabilities of partner nations and promoting operations that support common interests.[36]

Ideally, we hoped that by incorporating elements of the Coast Guard into GFS – whether it be personnel and/or procedures – we might ensure a more a capable asset by utilizing the existing expertise that they provide in non-traditional naval missions. At the very least, we could derive applications for GFS from the Coast Guard's expertise in non-traditional roles – roles both endemic and important to the Gulf of Guinea.

c. CNO's Guidance Letter

One other service document deserves mention, as it re-iterates GFS as a component of a Navy dedicated to influencing the stability of an increasingly inter-dependent world, and offers a slight twist to the nature of how it conducts business: the CNO's Guidance Letter of February, 2007. It states that "GFS offers a means to increase regional maritime security through the cooperative efforts of joint, interagency, and multinational partners, as well as nongovernmental organizations *without imposing a footprint ashore*."[37] This latter point marks a deviation from making the traditional naval mission of presence operations an inherent aspect of all Navy deployments. Though persistence remains a desired characteristic of GFS, the CNO clearly communicated a desire for GFS to be able to "tread lightly" when operating in politically sensitive regions of the world … without losing the capability to respond. Indeed, this might prove a vital

36. U.S. Department of Homeland Security and Coast Guard, *The U.S. Coast Guard Strategy for Maritime Safety, Security, and Stewardship* (Washington, DC GPO, 2007): 16.

37. Michael G. Mullen, *GPO Guidance for 2007: Focus on Execution,* (Washington, DC: GPO, 2007): 6.

characteristic to empowering international partnerships in regions where suspicion can easily undermine them, and where overt presence may fuel those suspicions.

C. PLACING OUR STRATEGIC GUIDANCE IN CONTEXT

As was stated, the intent of reviewing our strategic guidance in greater detail was primarily intended as a step considered fundamental to any systems engineering process: refinement. We did not find anything in our strategic guidance to counter the terminology of our definition of GFS, or the problem statement for our project; in fact, our studies of the NSS, NSMS, QDR, NOC, Coast Guard Strategy, and CNO's Guidance Letter bolstered the legitimacy of each. Beyond the direct influence of the NOC on our definition, the emphasis placed on working with civilian and non-military counterparts, as well as on shaping and stability operations, by the QDR re-enforced the use of "Shaping and Stability" in our definition and "Influence Operations" in our problem statement. The NSMS's address of defending commerce on the high seas lent credibility to our inclusion of "Theater Security Cooperation" and "Maritime Domain Awareness" in our definition, as well as to the importance of maintaining a military component of GFS - as we conveyed in our problem statement with the term "Maritime Security." Both the NSS and QDR substantiated the importance of a regional focus.

In addition to verifying our own definition of GFS, and the problem statement of our project, we gained other tangible results from our Strategic Guidance phase. The Coast Guard Strategy provided insights into non-traditional maritime tasks that GFS would find itself trying to address in the Gulf of Guinea. The "minimal footprint" aspect of the CNO's Guidance Letter helped us realize that our Strategic Guidance served not only as general guidance, but that specific system requirements might be gained by looking at these documents more closely. Finally, we understood that this guidance existed not only as a distinct phase with a succinct conclusion within our study, but in continuing with our theme of constant refinement, these documents would serve as a constant reference – and guide - throughout our studies.

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IV. FUNCTIONAL AREA ANALYSIS

To revisit what this phase entails, the FAA synthesizes the information gained from strategic guidance and general literature research, and breaks it down into smaller, manageable pieces. In the end, we hoped to identify quantifiable values in the form of objectives, capabilities, and/or requirements, from which measures would be derived to evaluate performance of current systems in the FNA.

We conducted our initial break-down by mission areas, identifying three that the group considered most important: Peacetime Engagement, Humanitarian Assistance/Disaster Relief (HA/DR), and Interagency & NGO Coordination. These selections were also influenced by strategic guidance, as they closely mirrored the NOC's mission breakdown of Maritime Security Operations, Crisis Response, and Civil-Military Operations, respectively. The former addressed the military-to-military aspect of shaping and stability operations, while we attempted to address the short-term/immediate-impact and the long-term/deliberate humanitarian aspects with the HA/DR and Interagency & NGO Coordination missions, respectively. In each of these, we attempted to decipher needs that, once pulled together as a group in the end of the FAA, would determine a set of capabilities from which to analyze current systems.

Descriptions relevant to our mission areas follow:

- *Peacetime Engagement*: This mission mostly encompasses military to military interaction. According to former Secretary of Defense William S. Cohen, Peacetime Engagements are those operations that "create an environment that encourages peace, discourages violence and instability, and builds confidence. At the same time, we also use resources to help diminish threats, counteract factors that lead to instability, and lessen the potential severity of conflicts that may arise."[38]

38. W. S. Cohen, "Creating an Environment for Peace, Stability, Confidence," *U.S. Foreign Policy Agenda*, http://usinfo.state.gov/journals/itps/1299/ijpe/cohen.htm.

- *Humanitarian Assistance*: Programs conducted to relieve or reduce the results of natural or manmade disasters or other endemic conditions such as human pain, disease, hunger or privation that might present a serious threat to life or that can result in great damage to or loss of property. The foreign assistance provided is designed to supplement or complement the efforts of host nation civil authorities or agencies that may have primary responsibility for providing humanitarian assistance. Humanitarian Assistance operations are those conducted outside the US, its territories and possessions.[39]
- *Disaster Relief*: Response to and preparation for "an act of nature (such as a flood, drought, hurricane, earthquake, volcanic eruption, or epidemic), or an act of man (such as a riot, violence, civil strife, explosion, fire or epidemic), which is, or threatens to be of sufficient severity and magnitude to warrant United States foreign disaster relief to a foreign country, foreign persons, or to an international organization."[40]
- *Interagency Coordination*: Within the context of Department of Defense involvement, the coordination that occurs between elements of Department of Defense, and engaged US Government agencies for the purpose of achieving an objective.[41]
- *NGO Coordination*: Supporting non-military interagency, NGO and IGO entities that will serve as "extensions" of GFS capability in influence operations.

In addition to studying the three mission areas, we concurrently conducted a country study of each Gulf of Guinea nation. The plan for this portion of our study was

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39. U.S. Department of the Navy, *U.S. Naval Warfare Development Command. TACMEMO 3-07.6-05 Humanitarian Assistance/Disaster Relief Operations Planning* (Washington, DC: GPO, 2005): Glossary-3.

40. U.S. Department of the Navy, *U.S. Naval Warfare Development Command. TACMEMO 3-07.6-05 Humanitarian Assistance/Disaster Relief Operations Planning* (Washington, DC: GPO, 2005): Glossary-2.

41. U.S. Office of the Chairman of Joint Chiefs of Staff, *Joint Operations, Joint Publication (JP) 3-0* (Washington, DC: GPO, 2006): GL-18.

to provide two outcomes: 1) providing a value base to our study by factoring in "the voice" of the African nations and people as we developed a system alternative intended to assist them - and in the process truly understand their issues, and 2) verify that the needs and functions discovered by mission groups were, in fact, pertinent to the Gulf of Guinea region before proceeding further. The first outcome added another element to our JCIDS process, known as value engineering:

> Value engineering is an organized way of defining a problem and creatively solving it. It requires a job plan. The job plan provides a system for the solution of the problem. The value specialist utilizes this system to understand, define, and determine a way to achieve good value. The use of functions to clearly define the purpose of the project and allocation of cost by function are unique techniques of value engineering.[42]

Though cost would be addressed later in our study, this certainly applied to our study. We considered our approach creative, as we sought an engineering solution to a largely non-engineering subject of providing regional stability, the JCIDS process was our plan, and our use of functional and mission hierarchies would provide the system by which to help define our project. In addition, we also considered our approach as value based in the following sense, as well:

> In the value analysis process, a major player who was often forgotten at crucial times in the past, the *user* has surfaced. The voice of the user/owner/customer is now heard in all public and private owners' planning sessions. Larry Miles emphasizes that a product must meet the customer's expectations in order to be acceptable.[43]

We believed that by studying country needs, we needed to consider the needs of the governments *and* the people: in other words, the true "end users" of GFS. In our opinion, this approach

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42. Muthiah Kasi, "An Introduction to Value Analysis and Value Engineering for Architects, Engineers, and Builders" (Course Guide, 1994): vi.

43. Muthiah Kasi, "An Introduction to Value Analysis and Value Engineering for Architects, Engineers, and Builders" (Course Guide, 1994): 2.

marked a deviation from many other engineering endeavors conducted for the Department of Defense, as systems are often built with senior leadership in mind as the customer. We believed that to truly offer solutions to regional socio-political-economic issues, they could best be understood from the perspective of the Nigerian fisherman whose fish stocks are being illegally depleted by foreign trawlers, for example – not by Naval Forces Europe, or even the CNO. All stakeholders have to be considered … in order to achieve a result of *value*.

A. PEACETIME ENGAGEMENT

1. Background

We expanded the definition of Peacetime Engagement from the 1997 Navy Operational Concept[44] to encompass myriad operations beyond "meet and greet" visits and interoperability exercises to unified security operations and the building of foreign navy capabilities in fulfillment of the Global Maritime Partnership concept:

> *Peacetime Engagements* are those operations requiring the use of military forces to create a safe, secure environment by preventing, neutralizing, or eliminating hostile actions and influences of adversaries, criminal elements, or other illicit actors.[45]

Considering the Global Maritime Partnership (GMP) initiative as a cross-functional concept that spans the breadth of many GFS missions and for which GFS is an enabler, we also considered that concept before proceeding further with peacetime engagement:

> The GFS is an enabler of the Global Maritime Partnership initiative, which seeks a cooperative approach to maritime security, promoting the rule of

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44. U.S. Department of the Navy, *Forward…From the Sea*, (Washington, DC: GPO, 1997).

45. U.S. Department of Defense, *Military Support to Stabilization, Security, Transition, and Reconstruction Operations Joint Operating Concept Version 2.0* (Washington, DC: GPO, 2006): 58.

> law by countering piracy, terrorism, weapons proliferation, drug trafficking, and other illicit activities.[46]

> GFS supports the COCOM's demand for theater security cooperation in the littoral regions of the world. Essential to the GMP concept is enhancing national sovereignty and joint, combined, inter-agency, multinational, and NGO cooperation. GFS, as part of GMP, maintains a persistent sea base of operations while minimizing our footprint ashore. This revolutionary concept leverages the core competencies of the USCG and will be non-threatening, focused on shaping and stability operations.[47]

To that extent, it was necessary to break Peacetime Engagement down into four primary sub-missions: Expanded Maritime Interception Operations (EMIO), Maritime Security Operations & Cooperation (MSOC), Counter Piracy, and Foreign Navy Capability Building (FNCB):

2. Functional Breakdown

We expand upon the following terms, relevant to Peacetime Engagement:

- *Expanded Maritime Interception Operations (EMIO)*: Efforts to monitor, query, and board merchant vessels in international waters to enforce sanctions against other nations such as those in support of United Nations Security Council Resolutions and/or prevent the transport of restricted goods, WMD, or illegal seaborne immigration (counter trafficking).[48] EMIO includes counter-terrorism operations to deny use of the maritime environment by terrorists, counter state and non-state support to terrorism, and enable partner nations to counter terrorists and their infrastructure in

46. U.S. Department of the Navy and U.S. Coast Guard, *A Cooperative Strategy for 21st Century Seapower* (Washington, DC: GPO, 2007).

47. U.S. Department of the Navy, *Naval Operations Concept* (Washington, DC: GPO, 2006).

48. U.S. Office of the Chairman of Joint Chiefs of Staff. *Joint Interdiction, Joint Publication (JP) 3-03* (Washington, DC: GPO, 2007): II-6.

the maritime environment. EMIO is characterized by *directed* engagement of *non-hostile, compliant* vessels.

- *Maritime Security Operations and Cooperation (MSOC)*: both sovereign inter-agency and multi-national partnering to ensure freedom of navigation, the flow of commerce, and the protection of ocean resources. Operations may include the enforcement of maritime regulations, embargoes, or blockades; protection of sea lines of communication; interoperability exercises with foreign navies and partner nations at sea when political considerations may preclude interaction on land (including UNITAS). The U.S. Coast Guard is a key partner. Characterized by *planned* activities with *maritime partners (foreign or domestic)* and *routine* engagement of seaborne traffic.
- *Counter Piracy* encompasses operations and campaigns to halt transnational crime (indirectly supporting HA/DR and Infrastructure Revitalization). Counter Piracy is characterized by *directed* engagement of *non-compliant* vessels. Maritime piracy, according to the United Nations Convention on the Law of the Sea (UNCLOS) of 1982, consists of any criminal acts of violence, detention, or depredation committed for private ends by the crew or the passengers of a private ship (or aircraft) that is directed on the high seas against another ship, aircraft, or against persons or property on board a ship (or aircraft.) Piracy can also be committed against a ship, aircraft, persons, or property in a place outside the jurisdiction of any State.
- *Foreign Navy Capability Building*: operations, exercises, training, and material assistance intended to directly enhance the naval capabilities of partner nations.

3. Determining Capabilities

From the primary mission needs of GFS, the team decomposed the functional capabilities required to accomplish those missions based on existing guidance in accordance with the FAA process. The five essential capabilities were identified as

Command, Control and Coordination, Regional Maritime Situational Awareness, “Ordnance on Target,” Visit, Board, Search and Seizure VBSS), and Training Ability, defined as follows:

- *Command, Control and Coordination* - The ability to exercise authority and direction by a properly designated commander over assigned and attached forces in the accomplishment of the mission. A commander performs command and control functions through an arrangement of personnel, equipment, communications, facilities, and procedures to plan, direct, coordinate, and control forces and operations in the accomplishment of the mission.[49]
- *Regional Maritime Situational Awareness* is the effective understanding of anything associated with the *maritime domain* that could impact the security, safety, economy, or environment of the United States. In a regional-specific environment the key is actionable intelligence. *Maritime Domain* is all areas and things of, on, under, relating to, adjacent to, or bordering on a sea, ocean, or other navigable waterway, including all Maritime related activities, infrastructure, people, cargo, and vessels and other conveyances.[50]
- *"Ordnance on Target"* actions are those requiring the direct use of force, either by shipboard weapons systems or force projection (such as riverine or special forces).
- *Visit, Board, Search, and Seizure (VBSS)* are maritime boarding actions and tactics, designed to capture enemy vessels, to combat terrorism, piracy and smuggling, and to conduct customs, safety and other inspections, as

49. U.S. Joint Requirements Oversight Council, *Joint Capability Areas Tier 1 & 2 Lexicon* (Washington, DC: GPO, 2006): 30.

50. Executive Office of the President of the United States, *The National Strategy for Maritime Security* (Washington, DC: GPO, 2005): 1.

employed by modern navies, marine and maritime services, military and police forces.[51]

- *Training Ability* – The ability to conduct training in any of the Peacetime Engagement mission areas and capabilities; ideally by the same personnel assigned to those mission areas. Training ability is the core capability that when combined with training capacity (the physical space and materials needed) comprises the capability to conduct training.

4. Summary

Figure 16 depicts the Peacetime Engagement hierarchy of interacting missions and capabilities.

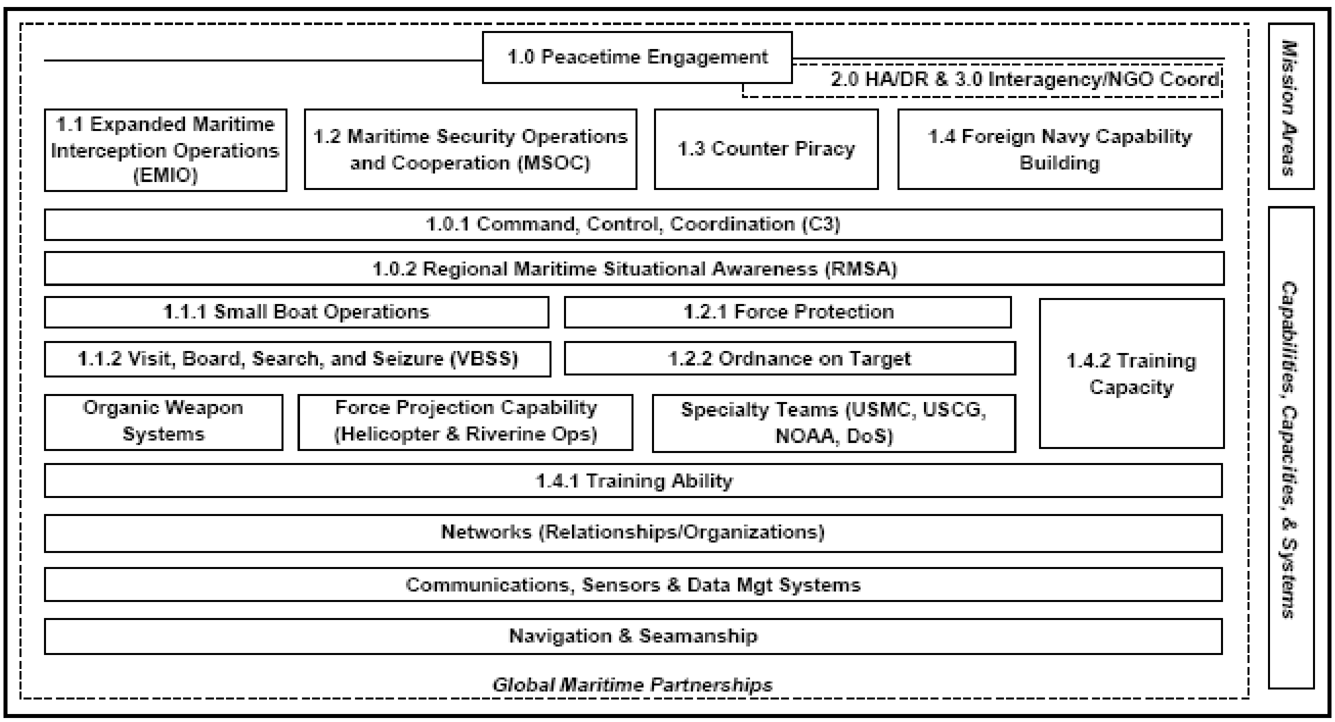

Figure 16: Visual Representation of the Peacetime Engagement Hierarchy

51. U.S. Department of Navy, *Navy Maritime Domain Awareness Concept* (Washington, DC: GPO, 2007).

B. HUMANITARIAN ASSISTANCE/DISASTER RELIEF

1. Background

Disasters are a part of life in all regions of the world, whether caused by acts of nature or acts of man. These events become humanitarian emergencies when their effects impact a society or population whose inherent resources are insufficient to absorb the impact and deal with the event's consequences. Many humanitarian emergencies and disasters are prolonged; therefore their impact is routinely felt beyond the immediate vicinity of the disaster. These effects can be mitigated through the use of external - but regionally located - relief sources to address the immediate needs of a stricken population and build a capacity to better cope and plan for humanitarian emergency/disaster relief (HA/DR) situations in the future.

a. Humanitarian Assistance and Disaster Relief Defined

Prior to discussing specific actions and requirements involved with responding to HA/DR events, it is important to provide a baseline understanding of what humanitarian assistance and disaster relief are. Joint Publication 1-02 defines humanitarian assistance as "those programs conducted to relieve or reduce the results of natural or manmade disasters or other endemic conditions such as human pain, disease, hunger or privation that might present a serious threat to life or that can result in great damage to or loss of property."[52] The foreign assistance provided by U.S. military forces is limited in scope and duration, and primarily designed to supplement or complement the efforts of host nation civil authorities or agencies that may have primary responsibility for providing humanitarian assistance.

Disaster relief is similar in definition to humanitarian assistance, but requires prompt aid that can be used to alleviate the immediate suffering of disaster victims. Joint Publication 1-02 defines disaster relief as "any act of nature (such as a flood, drought, hurricane, earthquake, volcanic eruption, or epidemic), or an act of man (such as a riot, violence, civil strife, explosion, fire or epidemic), which is (or threatens to

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[52] U.S. Office of the Chairman of Joint Chiefs of Staff, *Department of Defense Dictionary of Military and Associated Terms, Joint Publication (JP) 1-02 (Washington, DC: GPO, 2007).*

be) of sufficient severity and magnitude to warrant United States foreign disaster relief to a foreign country, foreign persons, or to an international organization."[53] Such relief typically includes humanitarian services and transportation; the provision of food, clothing, medicine, beds, and bedding; temporary shelter and housing; the furnishing of medical materiel and medical and technical personnel; and repairs to essential services.

HA/DR operations historically focus on the victims of natural disasters (or acts of nature) and destructive conflicts. An act of nature is defined as an unpreventable natural catastrophe such as an earthquake, a tidal wave, a volcanic eruption, a hurricane or a tornado.[54] Types of natural disasters and acts of nature include floods, droughts, hurricanes/typhoons, earthquakes, tsunamis, volcanic eruptions, and epidemics.

The following are definitions for what each "acts of nature" disaster entails, according to the Emergency Event Database[55]:

- *Flood*: A significant rise of water level in a stream, lake, reservoir or coastal region.
- *Droughts*: Periods of deficiency of moisture in the soil such that there is inadequate water required for plants, animals and human beings.
- *Hurricanes*: Large-scale closed circulation system in the atmosphere above the western Atlantic with low barometric pressure and strong winds that rotate clockwise in the southern hemisphere and counter-clockwise in the northern hemisphere.
- *Typhoons*: Same as a hurricane except that they occur in the Western Pacific.
- *Earthquake*: A sudden break within the upper layers of the Earth's crust, sometimes breaking the surface, resulting in the vibration of the ground; if

53. U.S. Office of the Chairman of Joint Chiefs of Staff, *Department of Defense Dictionary of Military and Associated Terms, Joint Publication (JP) 1-02 (Washington, DC: GPO, 2007).*

54. Law Dictionary Online, "Act of God," .http://dictionary.law.com/default2.asp?selected=2318&bold=act||god||of||.

55. EM-DAT: the International Disaster Database. http://www.em-dat.net.

strong enough will cause the collapse of buildings and destruction of life and property.

- *Tsunami*: A series of large waves generated by sudden displacement of seawater (caused by earthquake, volcanic eruption or submarine landslide), capable of propagation over large distances and causing a destructive surge upon reaching land.
- *Volcanic Eruption*: A discharge (aerially explosive) of fragmentary ejected, lava and gases from a volcanic vent.
- *Epidemic*: An unusual increase in the number of cases of an infectious disease, which already exists in the region or population, concerned. Types of epidemics include HIV/AIDS, malaria, and tuberculosis.[56]

Destructive conflicts are usually man-made events and include war, political upheaval or revolution, religious or political persecution, chemical or toxic spills, or nuclear incidents. These man-made disasters - or acts of man - are catastrophic events caused directly and principally by one or more identifiable, deliberate, or negligent human actions.[57] There are two main categories of man-made disasters: terrorist and accidental.

- *Terrorist Disaster*: The unlawful use of force against persons or property to intimidate or coerce a government, the civilian population, or any segment thereof, in the furtherance of political or social objects.[58] A terrorist event can be an aircraft assault; assassination; nuclear, chemical, biological, radiological or cyber attack; bombing or the result of civil strife.

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56. Maryann C. Mattonen, "The Use of Hospital Ships for Joint, Interagency, and Multinational Humanitarian Assistance Operations," (final report, Naval War College (2006): 3.

57. Baltimore County, Maryland. "Welcome to…Emergency Preparedness," http://www.baltimorecountymd.gov/news/emergency_prep/manmadedisasters.html.

58. Baltimore County, Maryland. "Welcome to…Emergency Preparedness," http://www.baltimorecountymd.gov/news/emergency_prep/manmadedisasters.html.

- *Accidental Disaster*: An unforeseen and unintentional act that occurs randomly, is caused by humans, and occurs in civilized regions. There are three main subcategories of accidental acts: industrial, transportation and miscellaneous. Accidental industrial disasters include chemical explosions and hazardous material spills. Transportation disasters include various types of water, air, railway or roadway accidents or catastrophes. A miscellaneous disaster may occur due to food poisoning, fires, building collapse or riots. Each of these events may result in vast fatalities and massive property damage.[59]

b. Increased Demand

During the past decade, humanitarian relief organizations have faced increasing demand for relief around the world, resulting in a tremendous expansion of financial, human, and material investment in the ability of these organizations to effectively intervene in disasters. Major participants of HA/DR operations include United Nations organizations, governmental organizations, non-governmental organizations (NGOs), international organizations (IOs), private industry, consulting firms, and academic institutions, and the military. This global expansion of HA/DR operations can be attributed to one of several factors, including increased regional ethnic conflicts, urbanization and increasingly vulnerable populations, changes in the conduct of war, increased numbers of NGOs, increased military involvement in conflict settings, and the role of the media in influencing organization or governmental actions.[60] In addition, the sheer magnitude of the natural disasters during this period may also be a factor, as witnessed in the 2005 Indonesia tsunami and Hurricane Katrina: in both of these cases, the overwhelming damage extended to the infrastructure meant to provide the first-response, thus providing a great demand for assistance from external sources.

59. EM-DAT: the International Disaster Database. http://www.em-dat.net.

60. Maryann C. Mattonen, "The Use of Hospital Ships for Joint, Interagency, and Multinational Humanitarian Assistance Operations," (final report, Naval War College, 2006): 3.

2. DOD Role in HA/DR Relief

"One of the reasons we have been able to respond effectively is because we have established these habits of cooperation together over many years ... we have built strong partnerships and standard operating procedures and when this disaster occurred we were able to reach back and put those into effect."

- Admiral Thomas B. Fargo, USN (ret)[61]

As scientists debate the impacts of changing global climates and their potential to increase the occurrences of droughts, floods and famine, there is no doubt of the increased need to respond given the modern world's increased capability to do so. In addition, an ever-increasing demand for HA/DR resources – exacerbated by world media interest and mounting public concern - make it likely that U.S. military forces will be called upon to support humanitarian and disaster relief efforts more frequently in the future. In fact, the DoD is no stranger to disaster relief operations. They have conducted HA/DR operations for decades, labeling these particular types of operations under the category of Military Operations Other Than War (MOOTW). MOOTW is defined in Joint Publication 3-07 as encompassing "the use of military capabilities across the range of military operations short of war."[62]

Numerous factors have increased the U.S. military's involvement in international HA/DR operations. The governments of stricken nations are routinely overwhelmed by the effects of the disaster and paralyzed by the scale of the necessary response. This is where the U.S. military steps in to support. The engagement of U.S. military forces in HA/DR operations will primarily be out of the necessity for speed of reaction. These forces have the expeditionary capability and skill-specific training to efficiently transport and distribute essential resources throughout the disaster area. These assets become even more important considering each HA/DR operation will take place in a unique and unpredictable environment. U.S. forces deployed in response to HA/DR situations must

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61 . Cossa, Ralph A., "South Asian Tsunami: U.S. Military Provides 'Logistical Backbone" for Relief Operation." *Foreign Policy Agenda* (November 2004).

62. Maryann C. Mattonen, "The Use of Hospital Ships for Joint, Interagency, and Multinational Humanitarian Assistance Operations," (final report, Naval War College (2006): 3.

ensure they are adequately prepared to address the natural consequences that result from a disaster.[63]

HA/DR operations remain an important element within the U.S. Navy's mission repertoire. The ability to conduct a naval humanitarian mission requires surface ships, fixed-wing airplanes, and helicopters; joint or combined operations among naval, land, and, increasingly, air assets; as well as delivery of humanitarian supplies directly into the affected country. The duration of the humanitarian mission also has an impact on force levels, since protraction can either deplete a fixed force or require reinforcements. In the past, humanitarian missions conducted from the sea in the absence of major land operations were rare, usually involving simple air drops. Many recent naval humanitarian missions have entailed joint and combined operations coordinating sea, land, and air operations. As fixed-wing aircraft and helicopters have become more available and dependable, they have been used in place of naval or land forces to deliver needed supplies. As a result, history has clearly shown that the effectiveness of sea-based humanitarian relief missions are impacted by size of the affected area, the rate of implementation, and the level of cooperation of the local populations. The smaller the region and the less interconnected it is by land, the greater the impact. Thus, the most successful naval humanitarian relief missions involve sea powers assisting islands or isolated areas, where the operation had the dual effect of replacing basic infrastructure and communications while assisting people in need.[64]

Coordination between the military and relief organizations through the exchange of information and joint coordination is important to prevent duplication-of-effort, maximize response efficiency, avoid counterproductive efforts, and ensure that military support to the affected population remains a positive and effective influence. From a DoD perspective, responding military commanders must ensure their efforts are coordinated and in-line with identified relief requirements, possess and maintain relief strategies and plans, provide support effectively and efficiently, and constantly gather

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63. Ralph A Cossa. "South Asian Tsunami: U.S. Military Provides 'Logistical Backbone' for Relief Operation." *Foreign Policy Agenda* (2004), http://usinfo.state.gov/journals/itps/1104/ijpe/update.pdf.

64. Bruce A. Elleman, "Waves of Hope. The U.S. Navy's Response to the Tsunami in Northern Indonesia," (monograph, Naval War College Newport Papers, 2007): 111-114.

information to ensure that the ever-changing needs of the affected populace are both identified and response measures are coordinated.

International HA/DR requires a broad range of services which the U.S. military is capable of providing. These services include providing security, especially for aid workers who have become targets of aggression or abduction and have experienced increased mortality. The U.S. military has air-lift and sea-lift capability to handle logistics and enable distribution of food, medicine, and supplies. Due to its advanced technology and communications systems, the DoD is capable of providing a highly organized response for large-scale operations. [65] The end result is that due to international instability, U.S. forces have and will continue to support the international relief effort in the country or region in which the emergency or disaster has occurred. "Future relief efforts from the sea will most likely be conducted by multinational coalitions."[66]

3. A Historical Perspective of DoD Support for HA/DR Operations

Over the centuries, militaries have provided assistance for the purposes of training for and responding to humanitarian crises, as well as in the interest of enhancing political interests. Early in the history of the United States, military officers were involved in humanitarian operations. The Lewis and Clark Expedition (1804-06), for example, conducted health and demographic surveys, practiced disease prevention, and provided patient care to Native Americans. During the Civil War healthcare and medications were provided to families of indigent volunteers, displaced civilians, and refugees.[67]

Humanitarian assistance has emerged as a priority of deployed U.S. military forces throughout the 20th century. The "Armed Forces Aid to Korea" program collected over $3.5 million, while volunteer Army physicians and nurses performed 320,000

65. Maryann C. Mattonen, "The Use of Hospital Ships for Joint, Interagency, and Multinational Humanitarian Assistance Operations," (final report, Naval War College (2006): 5.

66. Bruce A. Elleman, "Waves of Hope. The U.S. Navy's Response to the Tsunami in Northern Indonesia." (monograph, Naval War College Newport Papers, 2007): 114.

67. Jeffrey E. Drifmeyer and Craig H. Llewellyn, Overview of Overseas Humanitarian Assistance, Humanitarian and Civic Assistance, and Excess Property Programs, Report #02-01 (Bethesda, MD: Center for Disaster and Humanitarian Assistance Medicine (CDHAM), Uniformed Services University of the Health Sciences (USUHS), 2002): 17.

medical procedures.[68] In Vietnam, Navy and Vietnamese medical personnel provided daily care for an average of 250 patients, admitting approximately 100 children monthly from the local medically-underserved population.[69]

Since the fall of the Berlin wall, the number of military humanitarian assistance missions has increased dramatically. The following is a list of significant U.S. military involvement in HA/DR operations over the past two decades:

- Operation PROVIDE COMFORT (1991-96) involved providing security and humanitarian aid to Kurdish refugees in Northern Iraq.
- Operation SEA ANGEL (1991), in which Marine forces responded to a devastating flood in Bangladesh.
- Operations RESTORE HOPE (1992) and SUPPORT HOPE (1994-97), involving humanitarian intervention in Somalia and Rwanda, respectively.
- Operations UPHOLD DEMOCRACY (1994-95) and RESTORE DEMOCRACY (1995-96) in Haiti.
- Reconstructive humanitarian assistance following the horrors of “ethnic cleansing” in the Balkins (1991-2001).
- Operation STRONG SUPPORT (1998-99): hurricane disaster relief in Central America.
- Operation AVID RESPONSE (1999): humanitarian aid to Turkey.
- Operation FUNDAMENTAL RESPONSE (2000): humanitarian aid to Venezuela.
- Operation ATLAS RESPONSE (2000), providing humanitarian aid to Mozambique.

68. Jeffrey E. Drifmeyer and Craig H. Llewellyn, Overview of Overseas Humanitarian Assistance, Humanitarian and Civic Assistance, and Excess Property Programs, Report #02-01 (Bethesda, MD: Center for Disaster and Humanitarian Assistance Medicine (CDHAM), Uniformed Services University of the Health Sciences (USUHS), 2002): 17.

69. Jeffrey E. Drifmeyer and Craig H. Llewellyn, Overview of Overseas Humanitarian Assistance, Humanitarian and Civic Assistance, and Excess Property Programs, Report #02-01 (Bethesda, MD: Center for Disaster and Humanitarian Assistance Medicine (CDHAM), Uniformed Services University of the Health Sciences (USUHS), 2002): 17.

- Operation ENDURING FREEDOM – HORN OF AFRICA (2002): combined military and civic assistance operations based in Djibouti.
- Operation UNIFIED ASSISTANCE (2005): tsunami relief to Indonesia.
- TASK FORCE WRIGHT (2005): earthquake relief to Pakistan.

In terms of number of projects, countries, affected population, or U.S. personnel involved, deliberately planned humanitarian assistance projects rival the more publicized contingency operations. These operations have been and will likely continue to be overwhelmingly successful in changing the hearts and minds of both foreign populations and their governments.

4. GFS Concept of Operations for Conducting HA/DR Operations

If a disaster occurs and GFS were operating in the area, ideally it would provide the means to effectively coordinate relief efforts due to inherent capabilities associated with HA/DR. The GFS will provide an immediate command and control infrastructure to coordinate disaster relief efforts. GFS will have various NGOs and interagency representatives embarked which allows for quicker and more effective interaction between relief providers. Depending upon the platform selected, GFS may be capable of transporting (either via embarked helicopters, LCACs, or boats) specialized personnel (i.e. medical) to directly assist in disaster relief efforts. Because of the logistical and manpower limitations associated with most potential GFS platforms, any assistance provided ashore would most likely be directed in response to an immediate and short term requirement. Large scale HA/DR efforts typically require the allocation of several additional and large assets (i.e. hospital ships, military sealift transport, etc) – the combined total of which may not be likely to maintain a persistent presence given our fleet’s limited resources.

5. Functional Breakdown

The HA/DR mission for the GFS can be broken down into four functional areas, as the HA/DR Operations Planning TACMEMO suggests: infrastructure, medical assistance, logistical support, and communication.[70]

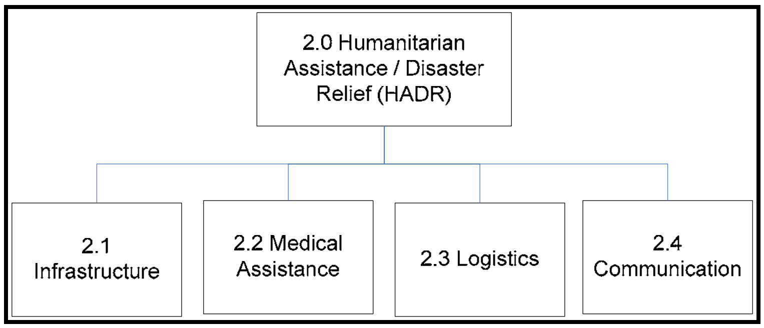

Figure 17: Top-Level Functional Hierarchy for HA/DR

a. Infrastructure

Joint Publication, 1-02, Department of Defense Dictionary of Military and Associated Terms defines infrastructure as "all building and permanent installations necessary for the support, redeployment, and military forces operations (e.g., barracks, headquarters, airfields, communications, facilities, stores, port installations, and maintenance stations.)"[71] There are two categories of infrastructure: physical and resource. Each are interdependent and provide GFS with the ability to maintain a sustainable presence in regions requiring humanitarian assistance. Resource networks are associated with personnel, organizations, materiel, and equipment essential in the deployment and distribution of the physical network. These networks include aircraft, ships, trucks/rail equipment, host-nation support, contractors, materials handling, civilian, government and military personnel, and automation.[72]

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70 U.S. Department of the Navy, *U.S. Naval Warfare Development Command. TACMEMO 3-07.6-05 Humanitarian Assistance/Disaster Relief Operations Planning* (Washington, DC: GPO, 2005).

71. U.S. Office of the Chairman of Joint Chiefs of Staff, *Department of Defense Dictionary of Military and Associated Terms, Joint Publication (JP) 1-02* (Washington, DC: GPO, 2007): 260.

72. U.S. Office of the Chairman of Joint Chiefs of Staff, *Deployment and Redeployment Operations, Joint Publication (JP) 3-35* (Washington, DC: GPO, 2007): III-8, III-9.

To maximize the assets provided by resource networks, command and control must be evaluated and integrated into the activity. Command and control is defined as "the exercise of authority and direction by the properly designated commander over assigned and attached forces in the accomplishment of the mission. Command and control functions are performed through an arrangement of personnel, equipment, communications, facilities, and procedures employed by a commander in planning, directing, coordinating and controlling forces and operations in the accomplishment of the mission."[73]

The United States Agency for International Development (USAID) is the primary agency in charge of foreign humanitarian assistance for the U.S. All foreign humanitarian assistance (FHA) provided by the United States is jointly coordinated by USAID's Bureau for Humanitarian Response and the Office of US Foreign Disaster Assistance (OFDA) (see Figure 18 and Figure 19). The responsibilities of these two agencies include organizing and coordinating the US government response, performing needs assessments and initiating procurement of supplies, services and transportation. FHA activities must be coordinated and cooperative relationships between military forces, government, and NGOs must be defined so a common goal is established. The United States Ambassador to the country receiving assistance establishes the Humanitarian Operations Center (HOC), provides the relief strategy, identifies logistic requirements for NGOs, and identifies, prioritizes, and submits requests for military support to the Joint Task Force (JTF) through the civil-military operations center (CMOC). A coordination center may be established by the combatant commander to aid in the coordination and planning efforts with outside agencies. A CMOC will be established to "provide interface between US military forces, relief agencies and other organizations."[74]

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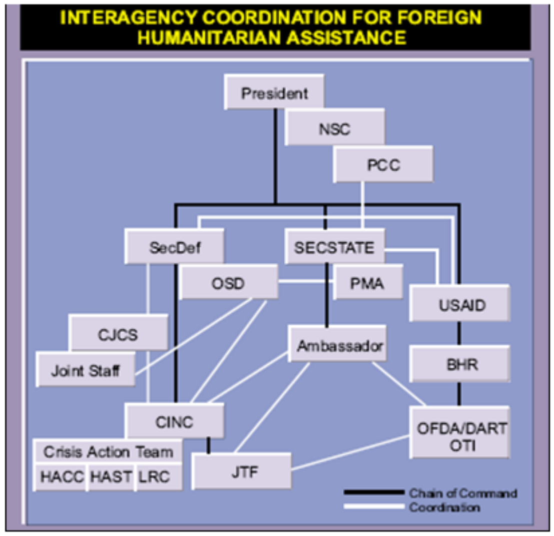
73. U.S. Office of the Chairman of Joint Chiefs of Staff, *Department of Defense Dictionary of Military and Associated Terms, Joint Publication (JP) 1-02* (Washington, DC: GPO, 2007): 101.

74. U.S. Office of the Chairman of Joint Chiefs of Staff, *Joint Tactics, Techniques, and Procedures for Foreign Humanitarian Assistance, Joint Publication (JP) 3-07.6* (Washington, DC: GPO, 2001): ix, IV-8.



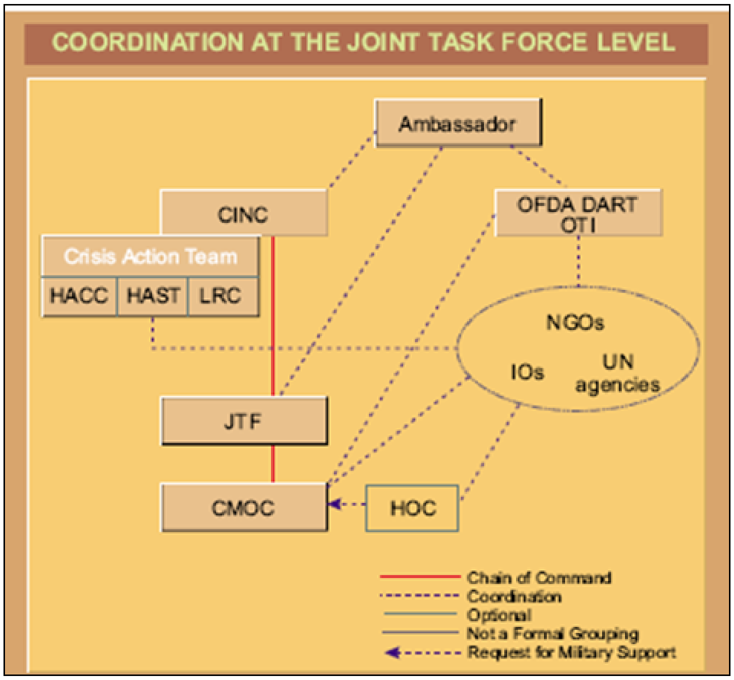
BHR	Bureau of Humanitarian Response	OFDA	Office of Foreign Disaster Assistance
CINC	Commander in Chief	OSD	Office of the Secretary of Defense
CJCS	Chairman of the Joint Chiefs of Staff	OTI	Office of Transportation Initiatives
DART	Disaster Assistance Response Team	PCC	Policy Coordinating Committee
HACC	Humanitarian Assistance Coordination Center	PMA	Principal Military Assistant
HAST	Humanitarian Assistance Survey Team	SecDef	Secretary of Defense
JTF	Joint Task Force	SECSTATE	Secretary of State
LRC	Logistics Readiness Center	USAID	US Agency for International Development
NSC	National Security Council		

Figure 18: Interagency Coordination for Foreign Humanitarian Assistance[75]

The combatant commander will provide support and assets to sustain transportation, communications and special operations as deemed necessary to accomplish the mission. A Humanitarian Assistance Survey Team (HAST) will also be assembled to gather information for operational planning. The HAST is able to "assess the nature and extent of (1) available food, water, and sanitation; (2) casualties and loss of life; (3) injury, illness, and the outbreak of disease; (4) displaced civilian population and location; (5) status of the government of the affected country; (6) degree of destruction to property and infrastructure; (7) available logistic facilities for air and

75. U.S. Office of the Chairman of Joint Chiefs of Staff, *Joint Tactics, Techniques, and Procedures for Foreign Humanitarian Assistance, Joint Publication (JP) 3-07.6* (Washington, DC: GPO, 2001): ix, II-12.

sealift, roads, and bridges; and (8) significant actors, the span and depth of their control over territory, resources and individuals, and their objectives."[76]



CINC	Commander in Chief	JTF	Joint Task Force
CMOC	Civil-Military Operations Center	LRC	Logistics Readiness Center
DART	Disaster Assistance Response Team	NGO	Nongovernmental Organization
HACC	Humanitarian Assistance Coordination Center	OFDA	Office of Foreign Disaster Assistance
HAST	Humanitarian Assistance Survey Team	OTI	Office of Transition Initiatives
HOC	Humanitarian Operations Center	UN	United Nations
IO	International Organization		

Figure 19: Coordination at the Joint Task Force Level[77]

[76]. U.S. Office of the Chairman of Joint Chiefs of Staff, *Joint Tactics, Techniques, and Procedures for Foreign Humanitarian Assistance, Joint Publication (JP) 3-07.6* (Washington, DC: GPO, 2001): II-9.

[77]. U.S. Office of the Chairman of Joint Chiefs of Staff, *Joint Tactics, Techniques, and Procedures for Foreign Humanitarian Assistance, Joint Publication (JP) 3-07.6* (Washington, DC: GPO, 2001): ix, III-6.

The ability to provide an initial assessment of food, water, and sanitation available in a disaster relief area will provide the GFS with the information necessary to deliver supplies and construct temporary facilities to allow for the affected population to remain healthy and maintain a minimal standard of living. Through the analysis of casualties and loss of life, as well as injury, illness, and the outbreak of disease, GFS will be able to provide medical supplies, facilities and treatment, to include mortuary facilities and grief counseling for the victims. An initial displaced population assessment will allow for temporary facilities to be constructed throughout the region. The temporary facilities could include housing, medical facilities, schools, airports, seaports, and roadways. While the military, government organizations, and non-government organizations are providing humanitarian assistance to the disaster relief zones, the status of the local and national government must be monitored for possible hostilities and instability. Establishment of significant actors will be evaluated to aid provide intelligence on control, resources, customs and objectives. The HAST assessment will overview the severity of property and infrastructure damage, again allowing for temporary facilities and provisions to be established until a long-term solution is enacted. HAST assessments will enable GFS to coordinate, provide, and sustain the facilities, personnel, and equipment necessary to aid the government and non-governmental agencies in providing humanitarian assistance.

The other infrastructure category, physical networks, are characterized by the type, number and condition of facilities, transportation networks, real estate, and modes of transportation available in the region of activity. The transportation network is the most vital in the physical infrastructure of a country requiring humanitarian assistance. If there are modernized and/or undamaged facilities available, insertion of military assistance, government and non-government agencies, and logistics support will be conducted more expediently and efficiently. The combatant command will establish an engineering support plan (ESP) to identify facilities, materiel and civil engineering capabilities in support of military forces. Examples of physical networks include airports, seaports, highways, railroads, bridges, tunnels, terminals, inland waterways,

storage facilities, pipelines and communication systems.[78] GFS will be capable of providing short-term physical network assistance to disaster relief zones and populations. This aid will be turned over to government and non-government organizations when properly established.

b. Medical Assistance

This functional component addresses the Navy's medical assistance and support capabilities in response to an overseas HA/DR missions. Humanitarian missions rely heavily on the ability to deliver primary medical assistance to those affected. This response capability makes the Navy an ideal HA/DR responder. The Navy's wide array of medical teams, hospitals, ships, and medical evacuation systems has provided them the capability to hastily deploy personnel, supplies and equipment to the most adverse and austere locations with little or no supporting medical infrastructure.[79] With the release of the Navy's new Maritime Strategy and identification of Humanitarian Assistance and Disaster Response as a core capability of the Navy, medical assistance will now have a dedicated focus on providing humanitarian care. Although a new core competency for the Navy, the DoD (under Title 10 U.S. Code Section 401) as a whole has annually conducted dozens of these humanitarian and civic assistance projects around the world.

Prior to deploying medical assets to a disaster area, careful consideration must be given to the environmental health risks. HA/DR operations are often conducted in areas where social services have been disrupted, resulting in poor sanitation, and inadequate food and water distribution. Significant health threats are likely, with the high prevalence of diseases that are endemic and/or can become epidemic, uncontrolled distribution of hazardous wastes and hazardous materials, and environmental extremes. These health threats impact both military first responders and local disaster victims. Beyond injuries caused by the disaster, it is anticipated that any HA/DR operational area will have disrupted social services, poor sanitation, and inadequate food distribution.

78. U.S. Office of the Chairman of Joint Chiefs of Staff, *Deployment and Redeployment Operations, Joint Publication (JP) 3-35* (Washington, DC: GPO, 2007): III-7, III-9.

79. Sean W. Kelley, "An Analysis of the Use of Medical Applications Required for Complex Humanitarian Disasters or Emergencies via Hastily Formed Networks in the Field" (master's thesis, Naval Postgraduate School, September 2005): 19.

Medical threats include naturally occurring infectious diseases, environmental extremes (flood waters, high/low temperatures, etc.) and potential injuries as a result of lawlessness and civil disturbances—presenting a potential threat to first responders. The degree of cultural and social interaction required to support the HA/DR mission, as well as the potential sharing of food and quarters with local nationals, will undoubtedly increase exposure of personnel to diseases endemic to the affected country.

Besides the environment, it is also important to understand the different medical support requirements of first responders and disaster victims. Historically, medical assistance has been provided by military medical personnel and units that are designed, equipped, staffed, and trained to provide combat casualty care, not humanitarian care, in support of military operations. One of the first differences in these types of care is that many of the people affected by a HA/DR crisis routinely suffer from varying combinations of malnutrition, chronic diseases, and microbial and parasitic infections. Often they have had little or infrequent access to even rudimentary health care services even prior to the crisis. The difficulties of medical humanitarian assistance are exacerbated not only by the austere, post-disaster, or sometimes hostile situations, but also by the absence of some support functions normally associated with military medicine. Of course, language barriers, societal norms, apprehension to the presence of uniformed military personnel, and differing cultural views on Western medicine introduce even further complications for military first responders.[80]

Secondly, disasters, whether manmade or natural, usually result in the loss or destruction of the public health infrastructure, which can lead to outbreaks of preventable diseases. Disasters, such as flooding, compromise the safety of water supplies and the integrity of sewage disposal, leading to threats of food and waterborne illness. Power line damage and power outages increase the risk of food borne illness and electrocution, not to mention hinder the ability of first responders to establish and operate medical treatment facilities. Animal bites, whether from dogs, venomous snakes, or

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80. Jeffrey E. Drifmeyer and Craig H. Llewellyn, Overview of Overseas Humanitarian Assistance, Humanitarian and Civic Assistance, and Excess Property Programs, Report #02-01 (Bethesda, MD: Center for Disaster and Humanitarian Assistance Medicine (CDHAM), Uniformed Services University of the Health Sciences (USUHS), 2002): 3.

insects are also seen in the aftermath of these natural disasters. Although combat operations provide a challenging environment for medical professionals, the ones described for HA/DR environments offer vastly different and unique challenges all unto their own.

The final distinction is that although the military and governmental agencies have the capability to provide basic medical assistance in these austere overseas environments, time and distance typically prevents them from participating as first responders. In combat operations the medical support assets are within relative close proximity of the participants, and thus there is typically little or no delay in care for injured personnel. The unpredictability in disaster locations and timing prevents the military from pre-positioning assets to serve as first responders throughout the world, although GFS could be considered the first attempt at resolving this discrepancy. And even if assets are within close proximity of a HA/DR crisis, they may not be adequately equipped (manpower or resources) to meet the immediate needs of the affected populace.

Regardless of the environment, the primary goal of medical personnel responding to a HA/DR crisis remains to deliver the best medical care to as many patients as possible. Among the military assets that are currently employed for HA/DR operations are the units and personnel of the DoD Military Health System (MHS). The MHS provides humanitarian assistance in response to situations ranging from contingency operations, disaster relief, and complex human emergencies to deliberately planned theater engagement activities. While military medical humanitarian assistance often includes patient care, it may also involve a wide variety of other projects, including construction or renovation of clinics and hospitals, or donations of medical supplies and equipment that is excess to the needs of the DoD.[81]

Using available lessons learned and research documents available from past DoD HA/DR response efforts, we were able to identify four key medical attributes. As illustrated in Figure 20, these attributes are Health Services, Plans and Operations,

81. Jeffrey E. Drifmeyer and Craig H. Llewellyn, Overview of Overseas Humanitarian Assistance, Humanitarian and Civic Assistance, and Excess Property Programs, Report #02-01 (Bethesda, MD: Center for Disaster and Humanitarian Assistance Medicine (CDHAM), Uniformed Services University of the Health Sciences (USUHS), 2002): 9.

Medical Logistics, and Administrative. These specific attributes provide a GFS platform the capability to provide immediate medical assistance and coordinate follow-on health service support activities.

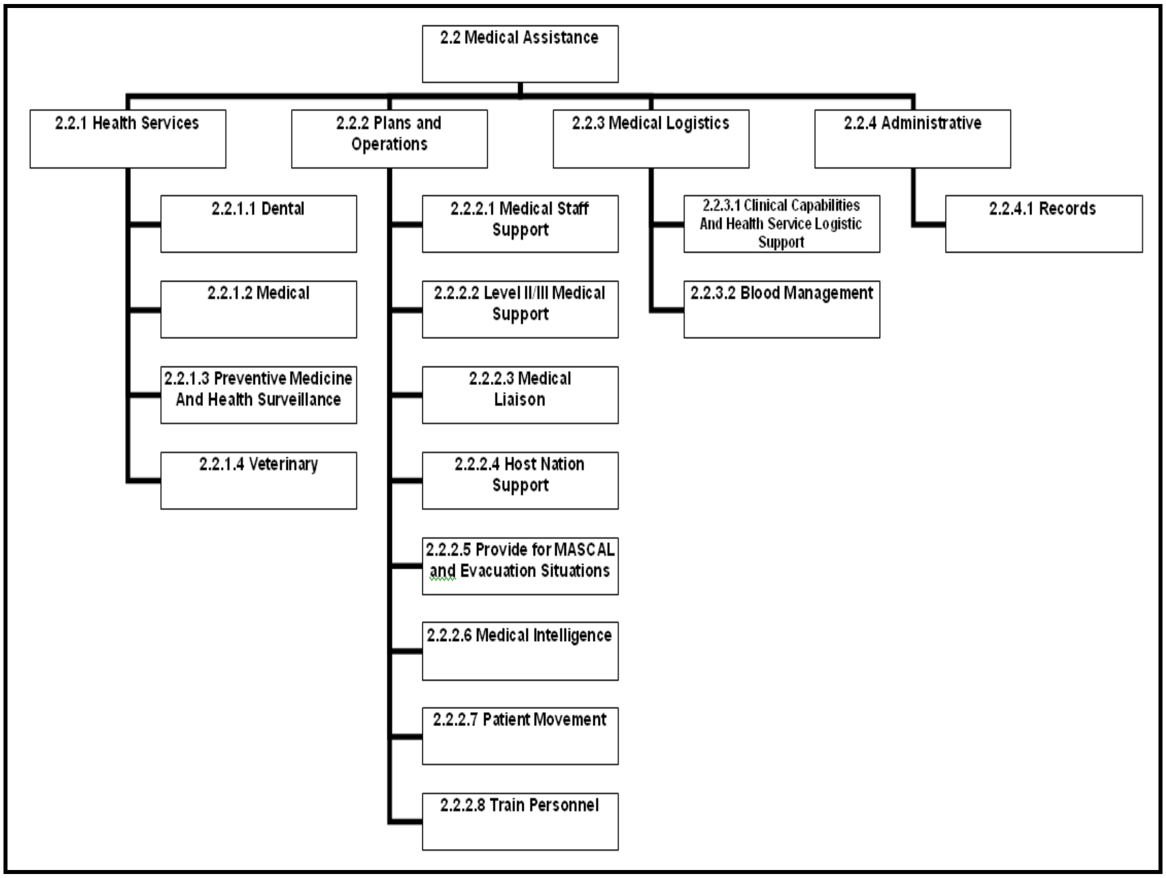

Figure 20: Functional Decomposition of Medical Assistance

The first attribute identified, health services, is designed to preserve, promote, improve, conserve, and restore the medical and physical well being of both the responding forces and affected population. This attribute includes providing emergency and routine dental, medical, preventive, and veterinarian services throughout an HA/DR environment.

Dental services are designed to provide routine, acute, and emergent dental services and care to individuals. Although dental care is preventive in nature, these services and resources must be included in the early planning stages because of the likelihood that an affected population will have had inadequate oral health facilities.

Besides treating, restoring, and maintaining oral health, dental officers also provide advice and assistance to operational commanders as required.[82]

Medical services are designed to provide routine, acute and emergent health services to individuals. Medical care in a HA/DR environment will focus on essential care, emergency surgery, and essential postoperative management to prevent death.

Preventive medicine is the anticipation, communication, prediction, identification, prevention, education, risk assessment, and control of communicable diseases, illnesses, and exposure to endemic, occupational, and environmental threats. These threats include non-battle injuries, environmental and occupational exposures, combat stress responses, weapons of mass destruction, and other threats to the health and readiness of military personnel. Because inhabitants of a post disaster environment are particularly susceptible to exposure, poor sanitation, overcrowding, and vector-borne diseases, an effective preventive medicine program can significantly impact the success of HA/DR missions by decreasing the risk of epidemic disease outbreaks through vector control, good sanitation, and education. Preventive medicine measures will typically include field sanitation, medical surveillance, pest and vector control, disease risk assessment, environmental and occupational monitoring and health surveillance, medical countermeasures, health threat controls for waste (human, hazardous, and medical) disposal, food safety inspection, and potable water surveillance. Preventive medicine programs should be established for both relief forces involved in the HA/DR mission as well as the affected population.[83]

Finally, veterinary services provide food inspection services, assuring food wholesomeness, safety, and security. The potential of food-borne disease, the threat of contamination of subsistence, the need to assess any endemic disease threats, and the need to provide health care all require an early veterinary presence throughout a disaster area. Services provided by veterinary units include sanitary surveillance of food source

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82. U.S. Office of the Chairman of Joint Chiefs of Staff, *Health Service Support, Joint Publication (JP) 4-02* (Washington, DC: GPO, 2006): III-8.

83. U.S. Office of the Chairman of Joint Chiefs of Staff, *Health Service Support, Joint Publication (JP) 4-02* (Washington, DC: GPO, 2006): III-4-III-5.

and storage facilities, and surveillance of foodstuffs to ensure a safe and wholesome food supply. Procurement of fresh foods, bottled water, ice, and beverages is supported by veterinary personnel through sanitation audits performed on local food establishments in the operational area.[84]

The next attribute, plans and operations, involves the coordination and cooperation of inter-agency, military, and non-governmental assets required to effectively respond to a HA/DR crisis. Following a natural or man-made disaster, medical requirements will range from emergency/trauma care to preventive medicine, to delivery of water, food, shelter and security. Thus, the coordination and execution of medical operations among the various respondents is multifaceted in a HA/DR environment. This plans and operations attribute includes medical staff support, level II/III medical support, medical liaison, host nation support, mass casualty (MASCAL) and evacuation, medical intelligence, patient movement, and training personnel.

Medical staff support is the advice and recommendations that operational commanders receive on matters relating to the state of health, sanitation, and medical readiness. Level II/III medical support provides large scale resuscitation, initial wound surgery, and postoperative treatment medical care for injured personnel. Medical liaison is the coordination that military assets conduct with outside relief agencies (i.e. Red Cross, NGOs, and IGOs) that provides a common understanding of the overall medical situation and requirements. Having this shared common operational picture aids in the effective coordination of response resources to the most critical needs.

Host nation support is the cooperative relationship developed with the host nation governmental authorities and civilian organizations to ensure complete support for medical assistance to an affected populace. Host nation support is important during a HA/DR operation because it serves as a force multiplier by reducing the lift requirements necessary to deploy military medical assistance to an affected area.

Beneath every seemingly routine HA/DR medical response plan is the possibility of a MASCAL episode during which the medical system establish by first

84. U.S. Office of the Chairman of Joint Chiefs of Staff, *Health Service Support, Joint Publication (JP) 4-02* (Washington, DC: GPO, 2006): III-6-III-7.

responders may become overwhelmed with a large number of casualties, stretching routine healthcare assets to the limits. Successful management of a MASCAL and evacuation situations are complex tasks where success relies as much on well-practiced logistics and communications as it does on skilled medical treatment.

As described in Joint Pub 1-02, medical intelligence is that category of intelligence resulting from collection, evaluation, analysis, and interpretation of foreign medical, bio-scientific, and environmental information which is of interest to strategic planning and to military medical planning and operations for the conservation of the fighting strength of friendly forces and the formation of assessments of foreign medical capabilities in both military and civilian sectors. Thus, medical intelligence reports can provide valuable information to operational commanders regarding communicable diseases, epidemiological data, and chemical and biological agents that may become an issue in an affected area. This becomes even more important when planning for and conducting a HA/DR mission because first responders must consider the health threat to the affected population and responding military forces.[85]

Patient movement is an element that focuses on providing a continuum of care and coordinates the movement of patients from site of injury or onset of disease, through successive levels of medical care, to a medical treatment facility that can meet the needs of the patient.[86] This process for selecting and moving patients is based on consideration of medical condition, locating available beds, route planning, and the selection of movement platforms and movement control.

The final element within the plans and operations attribute is the training of medical and non-medical personnel in first aid, preventive medicine, and advanced skills to support medical response to mass causality situations and HA/DR specific response threats. This training is important because it provides individuals within an affected population with the knowledge and skills to provide medical assistance to their neighbors long after the responding forces and agencies have left.

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85. U.S. Office of the Chairman of Joint Chiefs of Staff, *Health Service Support, Joint Publication (JP) 4-02* (Washington, DC: GPO, 2006): III-1.

86. U.S. Office of the Chairman of Joint Chiefs of Staff, *Health Service Support, Joint Publication (JP) 4-02* (Washington, DC: GPO, 2006): III-2.

The next attribute, medical logistics, involves the holding, issuing, and accounting for all medical, dental, and veterinary supplies (equipment, pharmaceutical, and consumables). Within this attribute are the elements of clinical capabilities and health service logistic support and blood management. Clinical capabilities and health service logistic support are the specific clinical capabilities, location, health service logistic supportability, and bed requirements. Blood management involves coordinating blood requirements and distribution of blood and blood products to support all operational requirements. The availability of blood and blood products is essential for management of the seriously injured and sick.

The final attribute, administrative services, involves maintaining and managing the health and dental records, and other documentation relating to the provision of health care to first responding and an affected population.

c. Logistics

Logistic principles are both fundamental and inter-related, and form a synergy that contributes to the successful conduct of logistics operations. Identifying those principles that have priority in a specific situation is essential to establishing effective support. All logistical efforts must first ensure effectiveness and strive for efficiency to best utilize scarce resources and successfully complete tasks and missions. Logistics principles include responsiveness, simplicity, flexibility, economy, attainability, sustainability, and survivability

Responsiveness is the right support in the right quantity in the right place at the right time. Among the logistics principles responsiveness is the keystone. Simplicity reflects the need to avoid complexity and often fosters efficiency in planning and execution. Flexibility is the ability to adapt logistics structures and procedures to changing situations, missions and concept of operations. Logistic economy is achieved when effective support is provided using the fewest resources at the least cost, and within the acceptable levels of risk. Attainability (or adequacy) is the ability to provide the minimum essential supplies and services required to begin operations. Sustainability is the measure of the ability to maintain logistic support to all users throughout the theatre

for the duration of the operation. Survivability is the capacity of the organization to prevail in the face of potential destruction.[87]

Logistics is the art and science of managing and controlling the flow of goods, energy, information and other resources like products, services, and people, from the source of production to the marketplace. It involves the integration of information, transportation, inventory, warehousing, material handling, and packaging. The operating responsibility of logistics is the geographical repositioning of raw materials, work in process, and finished inventories where required at the lowest cost possible.[88]

"Logistics is the process of planning and executing the projection, movement and sustainment, reconstitution, and redeployment of operating forces in the execution of national security policy".[89] Logistic functions include supply, maintenance, transportation, civil engineering, health services and other services.

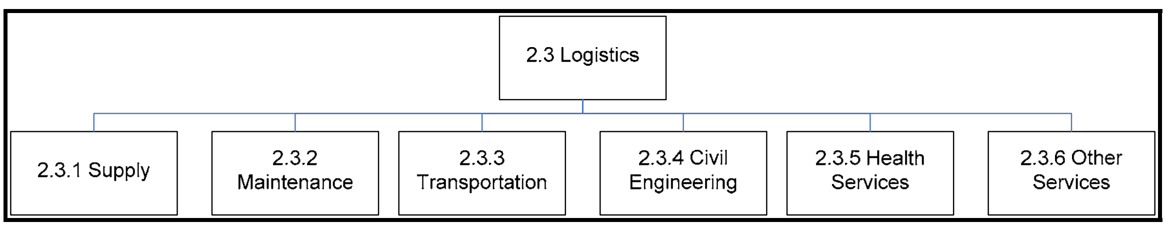

Figure 21: Functional Decomposition of Logistics

Supply is the function of acquiring, managing, and receiving, storing and issuing the material required by forces. Maintenance includes actions taken to keep material in a serviceable condition or to upgrade its capability. Transportation is the movement of units, personnel, equipment and supplies from the point of origin to the final destination. Civil engineering provides the construction, operation, maintenance, damage repair, and reconstitution of facilities, roads, utilities and logistic infrastructure. Health services include medical evacuation, hospitalization and, medical logistics,

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87. U.S. Office of the Chairman of Joint Chiefs of Staff, *Doctrine for Logistics Support of Joint Operations, Joint Publication (JP)4-0* (Washington, DC: GPO, 2000): II-3.

88. Wikipedia, "Logistics," http://en.wikipedia.org/wiki/Logistics.

89. U.S. Office of the Chairman of Joint Chiefs of Staff, *Doctrine for Logistics Support of Joint Operations, Joint Publication (JP)4-0* (Washington, DC: GPO, 2000): V.

medical laboratory services, blood management, vector control, preventative medicine services, veterinary services and dental services. Other services are nonmaterial support activities provided by service personnel and the logistics community that are essential to force support.[90]

In HA/DR missions, logistics elements may be employed in quantities disproportionate to normal military roles, and in non-standard tasks. Logistical forces may have continuing responsibility after the departure of combat forces in support of multinational forces, or PVOs and NGOs. Logistics planners should analyze the capability of the host nation economy to accommodate logistics support required by the US and multi-national forces and take care to limit adverse effects on the host nation economy. Any logistical analysis in support of HA/DR relief efforts must consider transportation requirements involved with these operations. Airfields and ports must be assessed, particularly those in underdeveloped countries where their current status will be in question. Delay in completing this assessment will directly impact the flow of strategic lift capability into the affected region. Additional forces may be required to build supporting infrastructure. This directly impacts the delivery of humanitarian cargo. Also, procedures must be established to coordinate movement requirements and airfield slot times with other participants in the operation. Availability of fuel and other key support items may impinge on transportation support.[91]

If a disaster occurs, GFS is likely to be tasked to provide logistical support to any HA/DR relief effort. When tasked, GFS would intervene in a disaster situation to provide all the required supplies, transportation, and services. GFS becomes an ideal logistic platform in this situation because land infrastructure becomes a secondary concern. GFS will require a port with off-load capability and land transportation for dispersion of the relief supplies, however air lift and air port facilities will likely not be a requirement as long as the port facilities in the affected nation remain relatively in tact.

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90. U.S. Office of the Chairman of Joint Chiefs of Staff, *Doctrine for Logistics Support of Joint Operations, Joint Publication (JP)4-0* (Washington, DC: GPO, 2000): V.

91. U.S. Office of the Chairman of Joint Chiefs of Staff, *Joint Doctrine for Military Operations Other than War, Joint Publication (JP) 3-07* (Washington, DC: GPO, 1995): IV-10.

The GFS platform will be required to have storage room for adequate relief supplies to include water and sanitation, food and nutrition, shelter, communications capability, Search and Rescue (SAR) capability, first aid and medical supplies, clothing, infant requirements, and provide for electricity and fuel requirements. In addition to storage for relief supplies the GFS will have to provide personnel including medical personnel, civil engineers, and logistics personnel as well as provide force protection for all personnel sent ashore with the HA/DR team. The GFS should have the ability to off-load the relief supplies onto shore. To do this will require manpower, crane lift and possibly an air or sealift capability.

Land transportation may be provided by existing host nation sources, however in the event that it is unavailable, GFS will have to be capable of transporting relief supplies to affected regions. Because we cannot predict the terrain, condition of roads and infrastructure, or the distance supplies will have to be carried we cannot possible predict what type, or how many vehicles will be necessary to complete an HA/DR mission. This requirement will have to be assessed on site and assets brought in as required.

Logistics is the cornerstone of any operation, if we do not have adequate logistical planning, support, and execution GFS will be unable to support any HA/DR response effort. Ultimately this could mean the difference between life and death for thousands of people affected by a disaster. GFS must be prepared to provide relief of any magnitude to people suffering due to a natural or man made disaster. While planning for all contingencies may be a logistical impossibility GFS can and should be prepared to be first responders in the event of a major disaster within its AOR. Maintaining basic relief supplies in quantities sufficient enough to provide relief to a large displaced population should be a major priority for any GFS platform.

d. Communications

This functional component addresses the means whereby appropriate technologies could be employed by Naval platforms to enable effective communications in a HA/DR environment. Successful HA/DR operations in the past have shown that the free dissemination of timely and pertinent information is essential to the prevention of

avoidable loss of life and property. During these situations, it is the timely and accurate processing of crisis information and effective communication that are the critical elements in successful disaster relief operations and, ultimately, have an influence on the long-term development of the affected area.[92]

HA/DR first responders face two major communication obstacles during any catastrophic event. First, heavily damaged or destroyed terrestrial networks often throw entire regions into a complete communications blackout. Second, even if a part of the existing infrastructure is operational, available lines quickly become oversubscribed by heavy traffic volume, making communications through them cumbersome or impossible. Communications networks must be set up quickly to enable responders to establish command and control of the overall relief effort. They must be capable of overcoming hardware, software, and bandwidth interoperability issues between military and civilian participants. This is of particular importance since international aid workers, military personnel, volunteers, and governmental officials are all competing for access into the affected area. This obstacle becomes even more significant for responding DoD assets because communication requirements for a HA/DR mission are uniquely different from traditional combat operations. The principle difference is that military commanders require a more unclassified, information sharing architecture for HA/DR operations in order to establish unity of effort and effectively collaborate and coordinate with the civilian agencies and non-governmental organizations involved in such an operation.[93] Ideally this architecture provides the ability to coordinate communications amongst the various responding resources, which is essential to operational success.

The vast majority of DoD's communication architectures, to include command and control traffic, voice conferencing, intelligence dissemination, and combat support traffic ride over the joint networks, are provided by Defense Information Systems Agency (DISA). DISA provides global classified and unclassified voice, data, video, and

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92. Tung Bui, Sungwon Cho, Siva Sankaran, and Michael Sovereign, "A Framework for Designing a Global Information Network for Multinational Humanitarian Assistance/Disaster Relief," *Information Systems Frontiers* (2000): 430.

93. Charles Daly, "Humanitarian Assistance and Disaster Relief Communications for the 21st Century," (research paper, Newport, RI: Joint Military Operations Department, Naval War College, May 2007): 2.

transport services today through a combination of terrestrial and satellite assets. These assets are predominantly commercial, though acquired and supplemented with military value-added features. They also include military satellite and a limited amount of military terrestrial infrastructure outside the continental United States. Military value-added features provide global reach and tactical extension, a defensive information operations capability, robust encryption, personnel and physical security, diversity of route and media, precedence, interoperability, and visible and controllable assets. These features are critical to insuring military forces, and for the purposes of this study a Global Fleet Station, are not denied access to information, geography, or space.

Using available lessons learned and research documents available from past DoD HA/DR response efforts, we were able to identify seven key communication attributes. As illustrated in Figure 22, these attributes include access services, voice, data services, applications, video services, satellite communication services, and communication security. These specific attributes provide a GFS platform with the capability to serve in a command and control capacity and/or as a first responder, depending on the situational requirements.

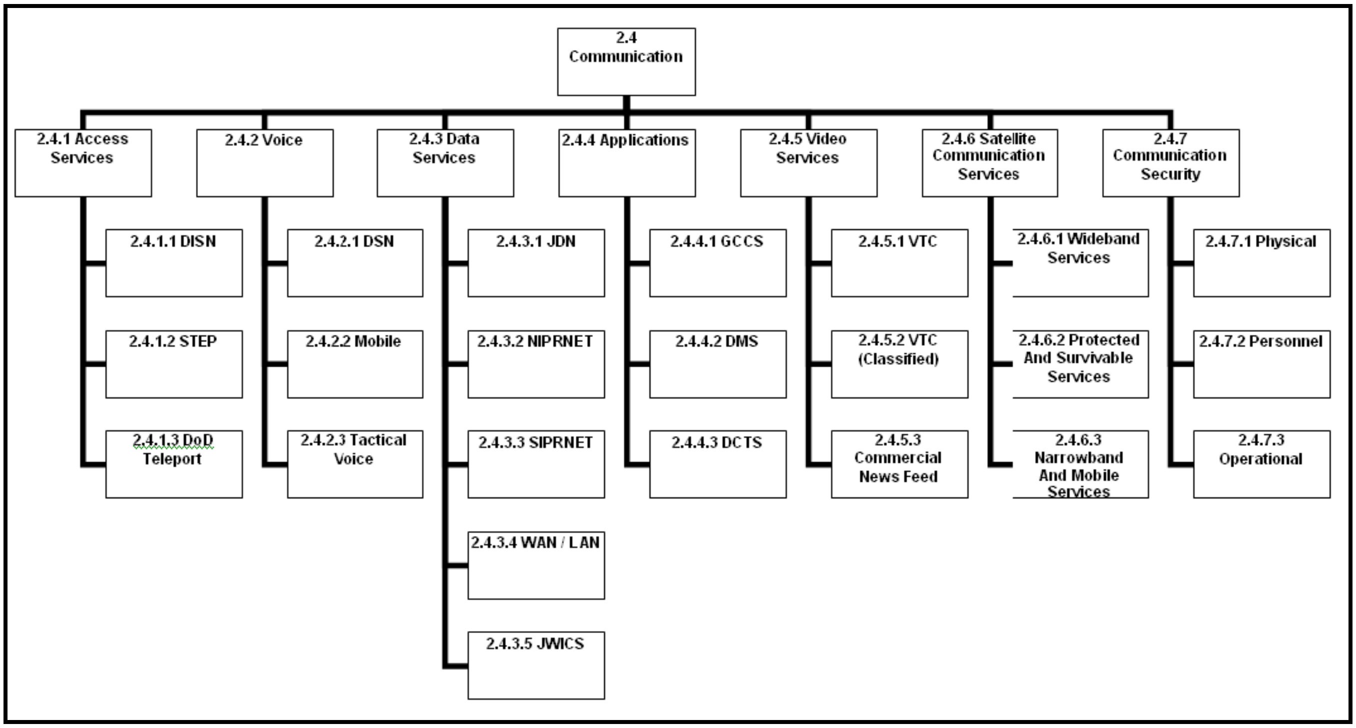

Figure 22: Functional Decomposition of Communication

The first attribute identified, Access Services, provides the foundation for all DoD communication assets in order to provide the required connectivity and promote the timely free flow of information. Access services are comprised of three specific Global Information Grid (GIG) Services: Defense Information Systems Network Interface (DISN), Standardized Tactical Entry Point (STEP), and DoD Teleport. DISN is the DoD's worldwide enterprise-level telecommunications infrastructure providing end-to-end information transfer for supporting military operations. It provides GIG network services to DoD installations and deployed forces. Those services include voice, data, and video, as well as ancillary enterprise services such as directories and messaging. STEP is the primary interface point between the sustaining base and deployed forces. The STEP program enhances the ability of the DISN to respond to the needs of the joint force. STEP provides predefined (tailored) support packages on a predefined timeline. This support is extended via common user transports and includes voice, data, and video

services. Finally, DoD Teleport provides commercial and military satellite access at selected STEP sites to improve DISN service access to the deployed joint force.[94]

The next key attribute is Voice communications. At the early stages of a HA/DR response, voice communications are the primary means of garnering an overall situational awareness and thus provide first responders with the capability to most effectively and efficiently employ and distribute essential personnel and resources. Non-voice communications can become an important requirement (narrowband, wideband and broadband data applications), dependent on the nature of the disaster, however, the need for voice communications will always be a major requirement. Voice communications includes Defense Switched Network (DSN), Mobile, and Tactical Voice.

The DISN provides global voice services through the DSN, a worldwide private-line telephone network. Multilevel precedence and preemption (MLPP) capabilities on the DSN ensures that the highest-priority calls achieve connection quickly, especially during HA/DR situations. DSN also provides global data and video services using dial-up switched 56 kbps or 64 kbps Integrated Services Digital Network (ISDN) services. Secure voice services are provided by the Secure Telephone Unit, Third-Generation/ Secure Terminal Equipment (STU-III/STE) family of equipment that provides end-to-end encryption over non-secure DSN circuits. Most importantly, DSN is available to all military services, governmental agencies, allies and DoD contractors. The availability and interoperability of this network can significantly improve overall situational awareness and the sharing of information and resources for responding forces operating in a HA/DR environment.[95]

Mobile voice communications are commercial, portable satellite systems capable of voice and data transmission. These Enhanced Mobile Satellite Services (EMSS) are provided via satellite-based telephone and data communication services, primarily utilizing existing commercial satellite resources (i.e. International Maritime Satellite or Iridium Satellite).

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94. U.S. Office of the Chairman of Joint Chiefs of Staff, *Joint Tactics, Techniques, and Procedures for Foreign Humanitarian Assistance. Joint Publication (JP) 3-07-6* (Washington, DC: GPO, 2001): II-3.

95. U.S. Office of the Chairman of Joint Chiefs of Staff, *Joint Tactics, Techniques, and Procedures for Foreign Humanitarian Assistance. Joint Publication (JP) 3-07-6* (Washington, DC: GPO, 2001): II-5.

Tactical Voice is comprised of military specific switching systems capable of operating in austere areas. The U.S. Navy's current shipboard tactical voice communications system is an audio frequency distribution system that is required to satisfy operational requirements for both tactical and administrative voice communications on twenty-four hour a day seven days a week basis.

The next key attribute is Data Services. Data Services are the various networks that distribute a broad range of data and/or information (ranging from tactical, classified, to unclassified). Data Services are comprised of the Joint Data Network (JDN), Non-Secure Internet Protocol Router Network (NIPRNET), SECRET Internet Protocol Router Network (SIPRNET), Wide-Area Network (WAN)/ Local-Area Network (LAN), and Joint Worldwide Intelligence Communications System (JWICS).

The Defense Information System Network (DISN) provides interoperable, secure Internet Protocol (IP) data communications services. The most prominent of these is the Non-Secure Internet Protocol Router Network (NIPRNET), which provides seamless interoperability for unclassified support applications, as well as controlled access to the Internet. This is important because during recent HA/DR operations, many responding organizations utilized the internet to disseminate information because it is an inexpensive means of communicating to the masses. The internet remains an inexpensive and efficient tool for disseminating information during a HA/DR crisis, provided the communication infrastructure in an affected area supports internet connectivity. However, utilization of the internet in these crisis situations is not always easy. Some issues involved with utilizing the internet as a communication tool during a HA/DR operation include channel over-load, reliability, and security. During a HA/DR response effort, the communication and IP networks are chaotic, overloaded, and subject to periods of unreliability and security vulnerabilities. In fact, any available internet connectivity in an affected area will likely be over a low-quality, narrow-bandwidth communications link at best. And even if the internet is available, taking the time and energy disseminating information over the internet is only useful if responders can quickly locate, comprehend, and effectively employ the information. Finally, should first responders arrive in an area

where network accessibility is an issue, they may be forced to first build or repair the infrastructure network in order for it to be available for the initial relief effort.[96]

SIPRNET is DoD's largest interoperable command and control data network, supporting the Global Command and Control System (GCCS), the Defense Message System (DMS), collaborative planning and numerous other classified war fighter applications. The LAN is a network of computers that are physically linked together on a single site without the use of telephone lines of any sort. The WAN is a network that has at least two parts (i.e. LANs) separated by a distance requiring the use of a data communications infrastructure. Important to the HA/DR mission is that the LAN/WAN would provide the underlying computer network support in any combined, multinational relief operation. Finally, JWICS is a computer network for classified information (up to and including SCI). Although communicating at the highest of classification levels is not a necessity, it does provide key decision-makers with an additional capability. This could be important should the need arise to discuss potential courses of actions or situations that may be politically sensitive or have strategic importance.[97]

The next key attribute is applications. Although there are literally thousands of computer network applications currently utilized on DoD networks, we chose to identify those that were essential in supporting HA/DR relief efforts. These applications included Global Command and Control System (GCCS), Defense Message System (DMS), and Defense Collaboration Tool Suite (DCTS).

GCCS is a suite of software applications and hardware designed for planning, execution, C2 of forces, data, information and multi-discipline intelligence processing. This application is valuable in that it directly supports decision-maker contingency and crisis planning requirements. DMS is a multi-level secure system for transmission of record message traffic in support of DoD. Message traffic enables the first responders with a means of communicating their situational assessment, logistical

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96. Tung Bui, Sungwon Cho, Siva Sankaran, and Michael Sovereign, "A Framework for Designing a Global Information Network for Multinational Humanitarian Assistance/Disaster Relief," *Information Systems Frontiers* (2000): 436.

97. U.S. Office of the Chairman of Joint Chiefs of Staff, *Joint Tactics, Techniques, and Procedures for Foreign Humanitarian Assistance. Joint Publication (JP) 3-07-6* (Washington, DC: GPO, 2001): II-5-II-7.

requirements, and recommendations to decision-makers outside of the affected area. DCTS is a DoD tool suite for interoperable collaboration. DCTS provides combatant commands, services, and agencies with an interoperable, real time asynchronous collaboration capability that includes voice and video conferencing, document and application sharing, instant messaging, virtual meeting, and whiteboard capability in support of DoD planning.[98]

The next key attribute is Video Services. Video Services involves the capability to transmit and receive video communication signals to and from the operational area. The importance of these video services, particularly Video Teleconferencing (VTC), can not be understated. In fact, assessments of the Indonesian tsunami relief efforts have noted that VTCs were critical in "driving the daily rhythm."[99] In its simplest form video services would include commercial news feeds, but it can also include classified or unclassified Video Teleconferencing (VTC).

The Defense Video Teleconferencing (VTC) System is a classified, closed global video network capable of voice, image, and data exchange supporting C2 functions of DoD. SCI-Level VTC is a classified, closed video network capable of voice, image, and data exchange supporting intelligence, and C2 functions of DoD. Commercial news feeds may be rebroadcast over DoD communications system or received via a commercially leased terminal. These commercial news feeds are important because they can provide decision-makers with valuable information regarding affected areas that first responders have yet to arrive in. As with all information provided there must be some caution in employing all news feeds because the media can tend to over-dramatize and skew their description of the situation based on the images presented. The fact remains that responders only have a limited amount of resources and therefore

98. U.S. Office of the Chairman of Joint Chiefs of Staff, *Joint Tactics, Techniques, and Procedures for Foreign Humanitarian Assistance. Joint Publication (JP) 3-07-6* (Washington, DC: GPO, 2001): II-7.

99. Emerald Express 06-1 (EE 06-1) Military Support in Humanitarian Assistance/Disaster Relief: Assessment Report, (Quantico, VA: Small Wars Center of Excellence (SWCOE), Marine Corps Warfighting Laboratory (MCWL) Wargaming Division, 14-15 Feb 2006): 17.

decision-makers must evaluate all available information when formulating their response plan.[100]

The next key attribute is Satellite Communication Services. Satellite-based communication services have become the backbone of many critical operations and disaster recovery plans. Satellites are the best and most reliable communication platform in these situations because fiber and terrestrial wireless networks can be disrupted by tsunamis, earthquakes, and hurricanes. Satellite communications are highly survivable (physical survivability and robustness) and independent of terrestrial infrastructure. They provide interoperability between disparate systems and networks, broadcast services over very wide areas, provide mobile wideband and narrow-band communications, and perform most effectively when terrestrial infrastructure is damaged, destroyed, or overloaded. Simply put, satellites provide individuals with an instant communication infrastructure. For this study, the Satellite Communication Services attribute is comprised of Wideband Services, Protected and Survivable Services, and Narrowband and Mobile Services.

Communications between responding assets is a major problem and is inevitably handled in informal ways. Another problem with communications concerns bandwidth allocation. Communication equipment is not typically designed to allow operators to change the bandwidth. Thus, too much bandwidth is traditionally allocated to equipment that remains unused throughout a HA/DR operation. Wideband Services provide high-capacity and broadcast communications coverage to meet increasing demands for information from military-owned and commercially-leased satellite systems.[101]

Protected and Survivable Services are those satellite assets that are anti-jam, nuclear-survivable, intercept, and exploitation capable. The key satellite system within this category with regards to this study is MILSTAR. MILSTAR is the core DoD

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100. U.S. Office of the Chairman of Joint Chiefs of Staff, *Joint Tactics, Techniques, and Procedures for Foreign Humanitarian Assistance. Joint Publication (JP) 3-07-6* (Washington, DC: GPO, 2001): II-8.

101. U.S. Office of the Chairman of Joint Chiefs of Staff, *Joint Tactics, Techniques, and Procedures for Foreign Humanitarian Assistance. Joint Publication (JP) 3-07-6* (Washington, DC: GPO, 2001): II-10.

C2 communications system that supports strategic and tactical missions through secure global communications.[102]

Finally, Narrowband and Mobile Services provide phone and data transfer capability for netted, mobile, hand-held, paging, and low speed broadcast. Satellite phones and terminals include a range of options, from high mobility/low data rate devices all the way up to fixed installations with higher bandwidth. Mobile satellite phones are similar in appearance and function to terrestrial cellular phones. They need direct, line-of sight access to the satellite, but because they use omni-directional antennas, they do not need to be aligned perfectly. Two satellite systems provide service for these types of phones in the Gulf of Guinea operational area. The first is Thuraya, which is a single, geostationary satellite that provides limited coverage for about 100 countries (the coverage area includes Europe; North, Central, and parts of southern Africa; the Middle East; Central and South Asia, plus oceans in these regions). The other is Iridium, which is a constellation of 66 low-earth-orbiting (LEO) satellites that provides secure and non-secure voice and data services to DoD tactical and non-tactical users.[103]

A key provider of mobile, low-to-medium bit-rate global coverage is International Maritime Satellite (INMARSAT), which provides the bulk use and pay-per-use alternatives that support information transfer requirements during both normal operations and periods of contingency or crisis. A recently privatized consortium, INMARSAT operates four geostationary satellites covering the entire surface of the earth, except for the Polar Regions. INMARSAT's terminals must be operated in outdoor locations, within the line-of-sight of an INMARSAT satellite.[104]

Communication Security is the final attribute. Communication Security ensures the availability, integrity, identification, authentication, confidentiality, and non-repudiation of friendly communication systems while denying adversaries access to the

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102. U.S. Office of the Chairman of Joint Chiefs of Staff, *Joint Tactics, Techniques, and Procedures for Foreign Humanitarian Assistance. Joint Publication (JP) 3-07-6* (Washington, DC: GPO, 2001): II-11.

103. Larry Wentz, *Technologies for Civil-Military Coordination in Disaster Relief and Stabilization and Reconstruction*. (Washington, DC: Center for Technology and National Security Policy, National Defense University, June 2006), 49-50.

104. Larry Wentz, T*echnologies for Civil-Military Coordination in Disaster Relief and Stabilization and Reconstruction.* (Washington, DC: Center for Technology and National Security Policy, National Defense University, June 2006), 50.

same communication systems. It also incorporates those actions taken to protect, monitor, analyze, detect and respond to unauthorized activity within DoD communication systems and networks. This attribute is comprised of Physical Security, Personnel Security, and Operational Security.

Physical Security involves the security policies and procedures in place with regards to the communications system components and facilities. Personnel Security are the security policies and procedures in place with regards to individuals authorized access to the communications system. Operational Security includes the procedures and techniques for protecting operational employment of the communications system components.

C. INTERAGENCY AND NGO COORDINATION

> *The military is not the best answer for providing humanitarian support, [General Zinni] said, but if there is a gap, the military will fill it. Increasingly, the military is asked to fulfill nation-building roles best suited by NGOs with humanitarian or capacity building skills. Yet, at the end of the day, the military is not in the NGO business.*[105]
>
> *– Summary by Craig Cohen on Lecture by General (ret) Anthony Zinni, USMC*

We considered that this facet of GFS – though not a mission per se – deserved special attention on par with that of the Peacetime Engagement and HA/DR missions. In large part this was due to a general trend noticed in strategic guidance, recognizing what "outside" agencies provide to an overall campaign for regional stability, as well as a historical perspective on lessons learned out of the changing nature of war and how to prevent it. We also determined limitations of what to address within this unfamiliar realm, understanding that civil-military relations – though under much scrutiny for improvement – have a long way to go before a truly integrated "Total Force" will evolve.

105. Craig Cohen, Susanne Martike, and Anita Sharma, "Civil-Military Cooperation in a Time of Turmoil," Woodrow Wilson International Center for Scholars, http://www.wilsoncenter.org/index.cfm?fuseaction=events.event_summary&event_id=100140.

This may involve further study beyond this one; still, we did glean some baseline capability requirements to foster and enhance inter-agency and NGO coordination and cooperation. In addition, we sought to offer a longer-term, more deliberate humanitarian solutions as a complement to reactive nature of the HA/DR mission.

1. Clear Guidance

In our strategic guidance, the emphasis on interagency and NGO coordination and cooperation is unmistakable:

From the Executive's NSS: "In the cause of ending tyranny and promoting effective democracy, we will employ the full array of political, economic, diplomatic, and other tools at our disposal, including … forming creative partnerships with nongovernmental organizations and other civil-society voices to support and reinforce their work."[106]

From the Secretary of Defense's Quadrennial Defense Review on inter-agency coordination: "Increasing unity of effort to achieve the nation's security policy priorities across the agencies of the Federal Government is essential. Only with coherent, leveraged U.S. Government action can the nation achieve true unity of effort with international partners … The Department [of Defense] is continuing to shift its emphasis from department-centric approaches toward inter-agency solutions."[107] In addition: "The Department issued guidance … to place stability operations on par with major combat operations … [and in implementing this] calls for improving the Department's ability of work with interagency partners, international organizations, and non-governmental organizations to increase capacities to participate in complex operations abroad. When implemented, the Department will be able to provide better support to civilian-led missions, or to lead stabilization operations when appropriate."[108]

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106. Executive Office of the President of the United States, *The National Security Strategy of the United States of America* (Washington, DC: GPO, 2006): 6.

107. U.S. Office of the Secretary of Defense, *Quadrennial Defense Review Report* (Washington, DC: GPO, 2006): 84.

108. U.S. Office of the Secretary of Defense, *Quadrennial Defense Review Report* (Washington, DC: GPO, 2006):), 86.

From the CNO and CUSMC's NOC: "We must … proactively seek to integrate the unique capabilities resident in the other services as well as other governmental agencies, partner nations, non-governmental agencies and private-venture organizations."[109] More specific to our project: "GFS offers a means to increase regional maritime security through the cooperative efforts of joint, inter-agency and multi-national partners, as well as Non-Governmental Organizations."[110]

2. The Need to Incorporate Governmental and Non-Governmental Agencies

The best entities to carry out missions relating to a Phase 0 environment may not always be the U.S. Navy and other military forces; rather, it might consist of a hybrid force incorporating State Department and/or NGO personnel into GFS. There are numerous NGOs, each with a detailed focus on a specific issue, making them inherently more prepared to deal with the host of country needs that West Africa may present than our multi-purpose fleet is prepared to do. Doctors Without Borders, for example, may have more human resources to deliver care to those affected by malaria in the country of Benin – especially as Navy corpsmen are consumed by Phase 2 conflicts elsewhere. In order for our Navy to conduct exercises with Nigeria's riverine forces, State Department officials will need to lay the groundwork for that interaction to occur. Indeed, some of these efforts and coordination points may occur separate from the GFS, but in the case of an austere environment, also may require it. In the end, the nature of our operational requirements for GFS will demand the integration of civilian counter-parts to the war-fighters deployed aboard it. If operating in an austere disaster relief environment, the requirement to coordinate and cooperate with these entities will be exponential. In addition, just as General Zinni alluded to, beyond the expertise that non-military forces offer, persistence and long-term solutions once ashore comprise another of their key attributes.

3. A Historical Perspective

109. U.S. Department of the Navy, *Naval Operations Concept* , (Washington, DC: GPO, 2006): 26.

110. U.S. Department of the Navy, *Naval Operations Concept* , (Washington, DC: GPO, 2006): 30.

The need for civil participation in conflict-ridden or potentially explosive regions is not new or untested: The U.S. Agency for International Development (USAID) participated in a rather successful "oil spot" tactic of reconstruction in protected villages of Vietnam, and continues to promote foreign economic and humanitarian assistance in the hopes of providing stability, and providing alluring prospects for international investment and business for regions in need of it. Their mission thirty years ago remains strong today, and it addresses one of the key operational concepts of regional stability today and in the future: to promote security by enhancing economic growth (and vice versa). This is only example of a mission vital to shaping a stable environment in a region such as the Gulf of Guinea, but one which the Navy, on its own, is unsuited to address.

4. Struggling With A Paradigm Shift and Limits to What We Can Achieve … For Now

A struggle for each side – both by the Navy and by "outside" agencies – is to cope with departing their comfort-zones, and it may pose the greatest single challenge to achieving true coordination and cooperation between military, inter-agency, and non-governmental entities. "Hippies", sailors, and pretentious subject matter experts from inside the beltway are now being called upon to work together in a united effort to confront the challenges of stabilization in troubled, pre-conflict regions. Is this achievable? One wants to "do good" irrespective of politics, the other wants to solve politics with "steel on target," while the other promotes the academic ideals of "capitalization spawning democracy" – none of which seem outwardly conducive to each other.

Though some might try to categorize the military as the primary stumbling block to interaction, NGOs and non-DoD agencies are equally or more reticent. For example, not all NGOs will be cooperative. Catherine Dumait-Harper, of Doctors Without Borders, encapsulated a common sentiment among many NGOs, remarking that "when humanitarian action is co-opted or subsumed into broader military and political

intervention, it may be perceived as interference."[111] Some NGOs, operating with complete neglect to political sensitivities in a region, may even subvert any united coordination for shaping and stability operations. Obviously, we will need to be selective regarding which NGOs we receive delegates from to deploy aboard GFS. Such selectivity must occur prior to their arrival aboard GFS.

The reality is that conflicted regions of the earth deserve the attention of the Hippies, the sailors, and the beltway bandits. Achieving the stability in those regions requires coordination between them. How we do that remains the challenge ahead.

5. First Steps

The first step to such coordination has been made by the Bush administration with the advent of the Office of the Coordinator for Reconstruction and Stabilization within the State Department (S/CRS). Their mission is to "lead, coordinate, and institutionalize U.S. Government civilian capacity to prevent or prepare for post-conflict situations, and to help stabilize and reconstruct societies … so they can [achieve] peace, democracy and a market economy."[112] One way in which S/CRS intends to conduct these missions is by deploying "Humanitarian, Stabilization, and Reconstruction Teams (HSRT) to Regional Combatant Commands (RCC) ... [and] desires to rehearse its response capabilities through active participation in military training exercises."[113] Though such proposals are being made with post-conflict planning as the primary driving force, it is hard to imagine that they are not – and should be – considered for pre-conflict operations.

6. Functional Breakdown: Working With What We Have

Understanding the strategic guidance and historical context under which we must address Interagency and NGO Coordination, and recognizing the limitations placed on it

[111]. Catherine Dumait-Harper, "Regarding 'The Responsibility to Protect," *Global Policy Forum* (2002): 1.

[112]. U.S. Department of State and Agency for International Development, *FY 2007 Joint Performance Summary Volume 1*, (Washington, DC: GPO, 2006): 13.

[113]. John C. Buss, "The State Department Office of Reconstruction and Stabilization and its Interaction With the Department of Defense", (master's thesis, Center for Strategic Leadership, U.S. Army War College, 2005): 3.

by the nature of the groups we are trying to integrate, we forged ahead with possible solutions … or our own first steps. Realizing the importance of bringing outside agencies to GFS for their expertise and for their long-term solutions as part of a stabilization campaign, we determined it would be desirable to attract the right ones, and support getting them to shore.

Catherine Dumait-Harper's fear of "militarizing" their peaceful mission demonstrates a limitation that must be addressed. She is not alone, as we discovered similar feeling by other NGO representatives at the GFS Planning Conference in Washington D.C. One way to attract these NGOs to a unified stabilization campaign may be to avoid the military perception of the campaign. Perhaps that may be accomplished by the appearance of the vessel we use itself, or by limiting our interaction with them ashore. Simply providing them with a means of transportation to the country of need, and taking care of their own basic needs on the way, may be the initial extent of interagency coordination – at least with some NGOs. In addition, we envisioned that in an austere environment, GFS may be called upon to act as a secondary embassy, or node for inter-agency and NGO coordination.

Our functional breakdown of GFS follows:

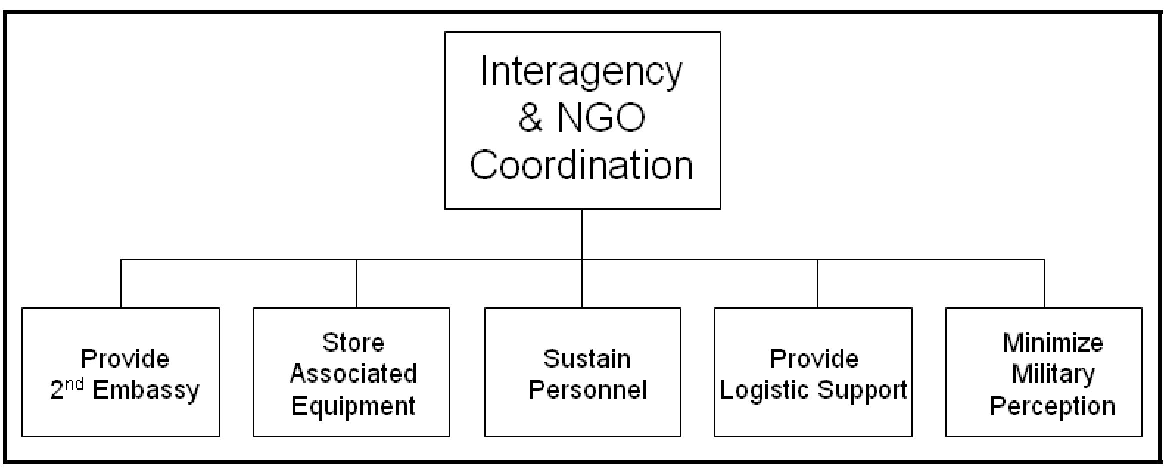

Figure 23: Interagency & NGO Functional Hierarchy

In summary, State Department and NGO interaction appear as a necessity in regional stabilization operations. Though military presence may provide a stop-gap to socio-political environmental issues that threaten this stability, it will be NGOs and

civilian government agencies such as USAID that provide the real cures inside the protected borders of West African countries in need. Though much of this integration will be policy vice system related, we must consider that civilian organizations will be a primary extension of GFS ashore as we seek to meet our operational requirements amidst the challenges of the Gulf of Guinea environment. In other words, we must design a system that includes the support of them in it.

D. COUNTRY STUDY

As delineated in the FAA introduction, we conducted our own research into the needs and attributes of the African nations which we intend to help. Many of the problems that face the military stem from a lack of understanding of the places we wish to aid. Our objective was to determine the needs of the countries at stake, and ensure that the missions for GFS were in-line with those needs, and thereby establishing a *value base* to our study. For example, it matters not that the U.S can provide Theater Ballistic Missile Defense for stability in the Gulf of Guinea. It matters far more that GFS is able to provide HIV/AIDS awareness, military-to-military training, and an HA/DR response.

Our country analysis focuses on the Gulf of Guinea countries of Liberia, Cote d'Ivoire, Ghana, Togo, Benin, Nigeria, Cameroon, Equatorial Guinea, Gabon, Republic of Congo, Democratic Republic of Congo, Angola, and Sao Tome & Principe. Utilizing a thorough literature research, and through conversations with NPS students from the region, we were able to garner a much better insight into the actual needs and perspectives of the West African coastal nations. The majority of the needs of the region fall under three categories: Political Unrest, Infectious Disease, and Economic Disparity. In the area of political unrest, we hope that the presence of GFS, and the spirit of cooperative engagement that it fosters, might help alleviate some problems – particularly if that unrest lies in relations between the country and the United States. GFS may more substantially influence the other two areas - Infectious Disease and Economic disparity – both of which influence stability in the region.

1. Political Unrest

Tyrannical leaders have emerged in the Gulf of Guinea region from time to time. The majority of the countries in our study are recovering from years of civil war. These internal conflicts, in many cases, have wrecked the countries' infrastructures completely. The lack of a solid infrastructure has hindered economic, political, and social progress significantly. In addition to destroying the country internally, civil wars have the added effect of diminishing foreign interests as well. Very few countries are willing to invest, in any means, in a country that is frequently involved in civil war. This lack of international aid only further fuels a countries decline. Liberia, Cote d'Ivoire, and Angola are examples of countries that are recovering from recent civil war.

Civil wars in these regions are most often started when the country is attempting to transition from a tyrannical, dictatorial, or oppressive regimes, to one of democracy. That is the sole reason why GFS will not aid significantly in deterring civil unrest: GFS is focused on Phase 0 operations with minimal footprint ashore. It would require a major military presence ashore to quell and rectify these situations, and *intervention by force is not the purpose of GFS.* On a positive note, many of these countries are making the transition to a more democratic political system, with relative peace in the coastal nations over the past few years.

2. Infectious Disease

It is well documented that HIV/AIDS in Africa is a wide spread epidemic and, therefore, is no surprise that it leads the list of medical issues in the region. However, the AIDS epidemic is *not* as severe in the Gulf of Guinea region as it is in other regions. The adult HIV/AIDS rate in the Gulf of Guinea is around 5 – 6 % in each country. This is well below the 18% adult AIDS rate in South Africa and even further below the 33% adult AIDS rate in Swaziland.[114] With that being said, it is also important that GFS has the ability to not only provide treatment, awareness, and prevention methods for HIV/AIDS but additionally provide medical care for other diseases (i.e., Malaria and

[114]. United Nations Agency for International Development. Joint United Nations Programme on HIV/AIDS, *2006 Report on the global AIDS epidemic, A UNAIDS 10th anniversary special edition* (World Health Organization: 2006): 18.

water borne diseases such as cholera, typhoid, and dysentery). These diseases are causing nearly as much damage to the population as HIV/AIDS but not receiving the same attention. The lack of clean water is a function of a lack of infrastructure to provide, process, and distribute clean water to everybody. GFS by means of a NGO or IGO could potentially help save many lives by providing this medical/environmental aid.

One of the less mentioned side effects of these diseases, especially HIV/AIDS, is that as the adults die from the disease their children are left as orphans. The children are more susceptible to turn to a life of crime and degenerate behavior just to survive. This is a major contributor to instability in the region.

3. Economic Disparity

The basis of any strong country is its economy. A strong economy is necessary to support a nation effort to move from a 3rd world nation to a modern nation. The GoG region is full of countries that wish to move up the ladder, but do not have the economy to do so. However, this lack of economy is not due to a lack of resources. The GoG countries are host to an abundance of natural resources. From the obvious resource of oil, to other resources such as timber, fish, minerals, and agricultural products, the Gulf of Guinea has plenty of resources to make a strong economy work. The problem lies within the management and enforcement of economic policies. Corruption is widespread in the region. The rich get richer and the poor get poorer. The economic divide is causing much chaos. In Nigeria for example, MEND (a militant group focused on oil) terrorizes oil platforms in part because Nigeria's abundant oil revenues, do not reach the local population. In their minds, the only method to get their share is to steal oil themselves and sell it on the black market. Another prime example of resources being mismanaged is the fishing industry. Over fishing by large foreign ships is a major problem, as the vast majority of people in the region rely on fish for some reason. Either they are fisherman who can not catch anything, or the people who rely of the fish for food. Either way the over fishing is a significant problem. Yet, the countries do not have the means to enforce fishing laws and agreements in place to regulate the industry. Illegal fishing costs the

region in excess of $1 billion a year.[115] Imagine what improvements could be accomplished if only a percentage of that revenue was able to be recovered and properly dispersed in the region.

4. Conclusions

Overall, the need for security both internal and maritime is paramount for the success of any Gulf of Guinea initiative. GFS can positively contribute to the maritime security aspect by providing ships, training, and NGO / IGO support in the Gulf of Guinea. There are significant pitfalls and obstacles in the way of progress. However, with the support and cooperation of both African countries and the United States it is not a complete lost cause to think that a positive improvement can be made. It will take a long term commitment from the U.S. to achieve the goals and state of security desired. The inability of the U.S to follow up on planned promises has left some African countries wary of our renewed interests in the region. They see the U.S as a country that promises big ideas, but does not follow up. The standing up of AFRICOM is being met with some resistance for that very reason. GFS has the ability to be the positive persistent presence necessary to obtain and maintain maritime awareness and security in the Gulf of Guinea.

E. ATTRIBUTES: DETERMINING SPECIFIC CAPABILITY REQUIREMENTS FROM MID-LEVEL HIERARCHIES

One may determine from the preceding findings that each of our teams - assigned top-level missions of Peacetime Engagement, HA/DR, and Interagency and NGO Coordination - developed their own sets of mid-level hierarchies to support those missions. Though unintended, these hierarchies differed from one another not only in content, but also in their approach. Out of Peacetime Engagement, we discovered that a mission and capability oriented hierarchy best described how to support the top-level mission of military-to-military interaction. For both the HA/DR and Interagency/NGO Coordination top-level missions, supporting hierarchies developed out of a functional

115. Vince Crawley, "United States Seeks to Help Improve Security in Gulf of Guinea," International Information Programs, http://usinfo.state.gov/xarchives/display.html?p=washfile-english&y=2006&m=December&x=20061219101202MVyelwarC0.1016352.

approach - not surprising, considering the similarities and mission-overlap between humanitarian assistance and NGO efforts.

We simultaneously determined region-specific needs with a team dedicated to defining the environment - also referred to as our “Country Team” – which worked not only to understand the regional needs country-by-country, but to check those needs against the hierarchal trees of our top-level missions. This “check” insured that our FAA process remained applicable to the region, and that all major regional needs would be addressed by one of our mission areas. This was a two way process: mission teams remained aware of regional needs via updates from the country team as they developed their hierarchies, and the country team checked the mission teams’ mid-level hierarchies for regional applicability. Any remaining needs not addressed by the mission areas were saved for future incorporation.

With these varied approaches – mission/capabilities hierarchy versus functional hierarchies versus regional needs – we discovered a common method by which to tie all of our findings together, and by which to conclude our FAA process: attributes. Defined, “attributes are the properties or discernable manifestations of the components of a system … [they] characterize the system.”[116] Applying this definition liberally, we preferred to describe the term “attribute” as a *specific capability*, in large part to maintain the capabilities based characteristic of the JCIDS process. In more general terms, we simply wanted to summarize, in more specific detail, what we wanted GFS *to do*.

116. Benjamin S. Blanchard and Wolter J. Fabrycky, *Systems Engineering and Analysis 4th Ed.* (Upper Saddle River, NJ: Pearson, Prentice Hall, 2006), 3.

Figure 24 depicts the FAA as we entered into its final step of determining our system attributes:

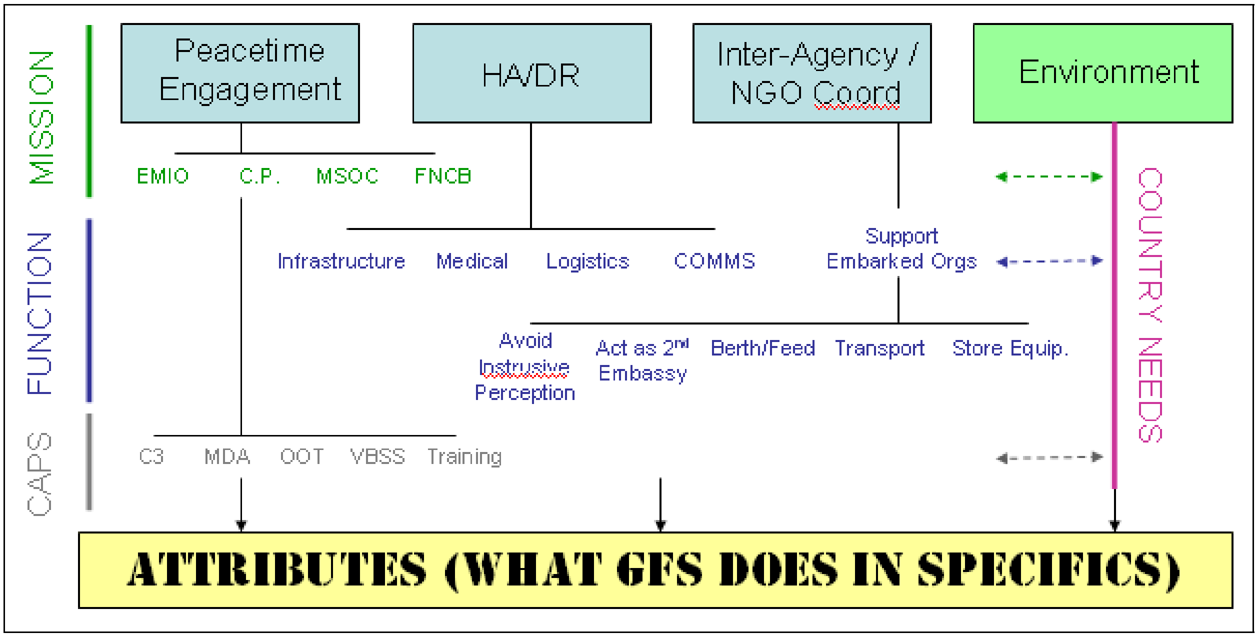

Figure 24: Conclusion of FAA Functions

As a starting point toward determining our attributes, we reviewed the Joint Capability Areas Lexicon for tier 1 and tier 2 capabilities. Some of these, such as the "Networked" attribute, led our Peacetime Engagement Group to adopt a similar one of their own: "Command, Control and Coordination (C3) Integration" (see Figure 25) Other approaches to determining attributes were more obvious given their mid-level hierarchy origins. For example, though not contained in the Joint Lexicon, a "Construction Services" capability seemed like a logical attribute to fall under the HA/DR function of providing infrastructure. We derived all attributes out of our mid-level functions, capabilities, missions, and needs.

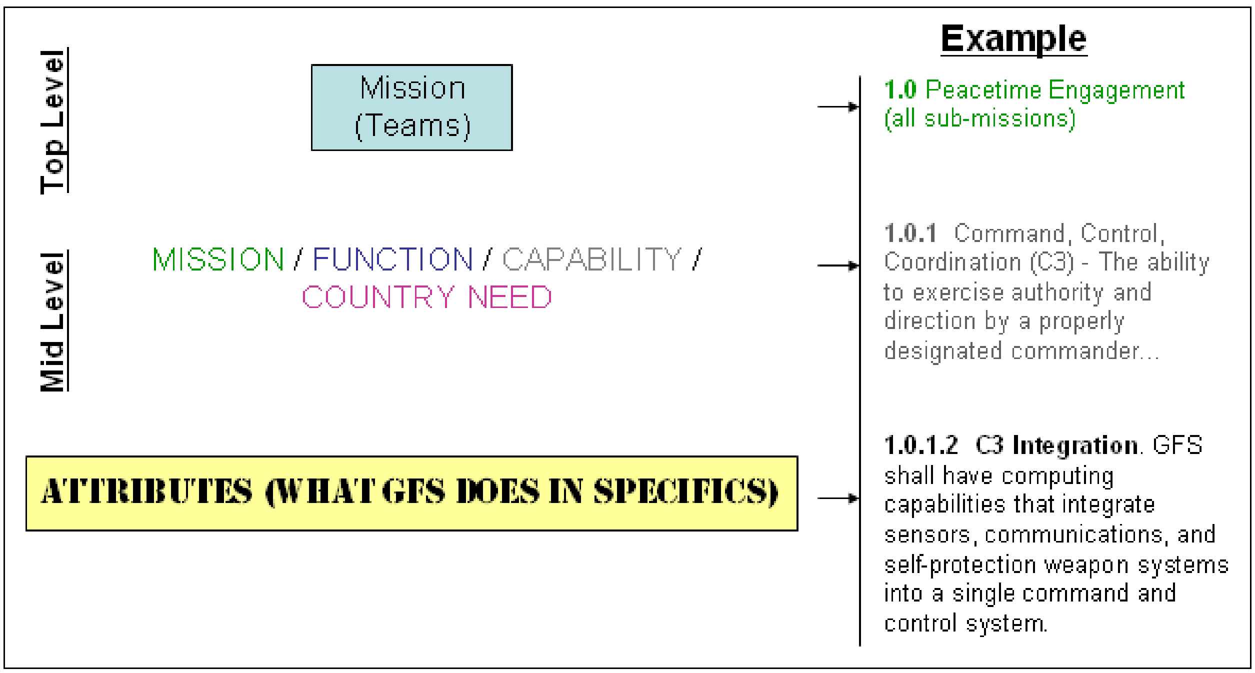

Figure 25: An example of deriving attributes within mission teams

One special case developed out of our Country Team's efforts, as they determined their own set of attributes from needs not met by the mid-level functions of the mission groups. One example included a specific capability for "Fisheries Protection" and [building] "Fishing Regimes." Recognizing that we had an attribute which currently did not fit under any top level mission, we developed a "Fisheries Enforcement" military-to-military function under our Peacetime Engagement mission to incorporate it. Other regional-specific attributes not met by our mission sets – usually due to their shore-side

or long term nature – were placed under the top-level mission of Interagency/NGO Coordination, and we made an assumption that they would be handled indirectly as extensions of our function of supporting interagency and NGO entities. Though these latter attributes would eventually help develop our scenarios, they were not included in the common set of GFS attributes, as they would be considered "handled" by the attributes falling under the function of "Interagency/NGO Support." These examples of "reverse engineering" further highlighted the value of truly understanding regional needs before applying general systems solutions to overarching global issues.

With a solid set of attributes in place, we were able to derive scenarios which encompassed a majority of regional issues. Perhaps even more important to our systems process, our attributes also provided the metrics by which to measure the performance of potential system alternatives. In other words, our attributes served as a conduit from *qualitative* and specific capabilities to *quantitative* and/or subjective methods of measuring performance of potential system alternatives. These attributes provided our project team with the perfect segue into FNA. They were the common piece – though still derived from mission areas – that would comprise our GFS. Indeed, they would characterize it.

F. A REGIONAL FAA PROCESS, WITH GLOBAL APPLICABILITY

Throughout our FAA process, region-specific considerations are evident; indeed, this was our intention after we decided to focus on the Gulf of Guinea. What we did not anticipate was a potential global application to our regional process.

Though regional attributes were considered in determining top level missions, mid level hierarchies, and the resulting attributes, a closer look reveals that these mission sets could be applied globally – with some minor modifications. The top level missions address the military-to-military, short term disaster response, and the long term socio-economic issues encompassed by shaping and stability operations world-wide. Adopting these specific top level missions of Peacetime Engagement, HA/DR, and Interagency/NGO Coordination provides the beginnings to an FAA process framework from which to derive GFS solutions for any region of the world. At the mid level, our functions, capabilities and mission sub-sets are not strictly applicable to the Gulf of

Guinea. For example, supporting embarked agencies and NGOs – a function of the Interagency/NGO Coordination mission – would be applicable to any region. Indeed, which NGOs are employed would be a regional consideration, but the ability to employ NGOs would not be. Perhaps, with future research on other regions, others may add to our mid-level hierarchies in order to provide a complete, global base. With this, it could be tailored using a Country Team to select the functions and capabilities – along with their attribute sub-sets – applicable to their specific region. For example, perhaps a function of "Provide Canal Security" might be added to the base list. A regional process applied to Latin America may find this function useful as it develops a GFS system alternative, with Panama Canal security as one of its primary considerations, whereas a GFS system alternative designed for a strictly oceanic environment would eliminate that function from its FAA process considerations.

The key concept gleaned from this is a truly global *process* for determining a GFS platform for a specific region (or a GFS "Process Model" application to regions: see Figure 26). The process is global, but the product is regional. In essence, all that would be required for any regional GFS proposal would be a country-by-country study of needs before applying them to our model. All of the FAA process legwork of identifying top level and mid level hierarchies would already be complete ... or as some might say, "Just add water!"

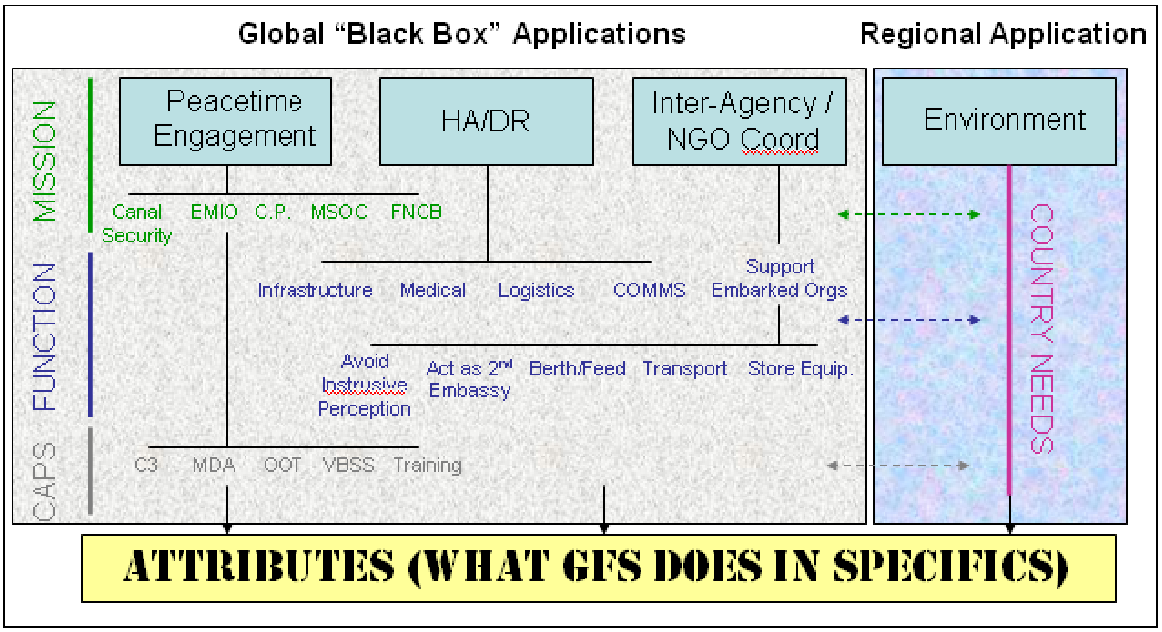

Figure 26: Global "Process Model" with Regional Application

V. FUNCTIONAL NEEDS ANALYSIS

To revisit what this phase entails, the FNA identifies the "gap" between what is desired of our system alternative – as described by the attributes determined in FAA – and what currently exists from U.S. Navy inventory and doctrine. We started by identifying "current capability" for GFS as a whole. Up to this point, we resisted the temptation to label possible system alternatives by simple qualifications such as "ships," "airplanes," or "mission doctrine." Indeed, we recognized that in our FSA, combinations of all might compose a GFS system alternative proposal; in FNA, however, we limited "current capability" to ship platforms. We then continued our process with a "stove-piped" theme, maintaining the integrity of our Peacetime Engagement, HA/DR, and Interagency/NGO mission groups. Each group then generated scenarios emblematic of major issues in the Gulf of Guinea, relevant to their respective missions. These scenarios provided the means by which to measure and quantify the performance of our "current capability" in shaping and stability operations – by GFS mission areas. *Weights* – or measures of importance – were applied to attributes with scenarios in mind (whether directly, or via weights applied to mid-level missions and functions). Mission teams then determined *value scores*, measuring how well each "current capability" asset fulfilled the weighted attributes. Once each asset was graded within the context of each mission area, we then synthesized those results into a single list of "best" alternatives for GFS, via maxi-min, maxi-max, least-regret, and expected value matrices. This marked the end of our stove-piped approach, and the beginning of a comprehensive look at GFS system alternatives. We then factored in cost, which yielded a "most effective" list of alternatives out of our "current capability" inventory. Having determined these lists, we also determined the inefficiencies and performance gaps of each system alternative along the way; in other words, we identified our gap.

A. DETERMINING CURRENT CAPABILITY

1. System Alternatives (Current Capability) Narrowed to Ship Platforms

"Current capability," as applied to GFS, proved a relative term as we considered the possible implications of the pilot programs, the sea-based focus of our problem statement, and current system inventories. Without a single *modus operandi* (or concept of operations) in place regarding GFS employment or capability requirements, we had to decide what constituted our baseline for current capability. The pilot programs seemed a convenient choice, given their status as the only existing Navy application of the GFS concept to this point; however, we still considered these pilots as reactionary in nature – not something to base a major phase of a deliberate systems process on. The sea-based focus of our project, as implied in our problem statement, eliminated air and land-based options for current capability. Though we still realized that future system alternatives may involve operational, command and control, doctrinal and even land-based systems architectures, we determined that a sea-based GFS must be platform oriented: without a platform, seaborne system architectures simply do not exist. Platforms at sea also take the form of vessels … or ships. This point received further emphasis from Admiral Henry Ulrich, Commander of Naval Forces Europe, as his command considered options for the APS: "We came to the conclusion that the way to do this is to use a delivery vehicle. We use a ship -- go figure -- as we talk about maritime safety and security."[117] In addition, ships intrinsically provide most basic physical and technological frameworks – as well as operational employment characteristics – from which future GFS constructs may develop. Indeed, ships would provide a great baseline by which to determine current capability. The question did remain, however, "Which ones?"

117. Henry Ulrich, "Special Department of Defense Briefing with Gen. Ward and Admiral Ulrich from the Pentagon, Arlington, Va," http://www.defenselink.mil/transcripts/transcript.aspx?transcriptid=4059.

2. Criteria for Determining Possible Platforms

In determining what specific ships, or combinations thereof, should constitute our "current capability," we considered the attributes that would need to be met, and applied our collective expertise on the topic of naval vessels (nine of us are Surface Warfare Officers). In addition, we determined that ships must be drawn from current inventory, but not necessarily out of current doctrine (I.E. how a vessel is typically employed). In other words, a cruiser could be considered "current capability," as it exists and is available out of inventory – even if the current Fleet Response Plan (FRP) currently does not account for dedicating a ship to the Gulf of Guinea (much less in the role of GFS). We dared such liberal application of doctrine due to the fact that no current concept of operations accounts for a GFS role or mission for its assets.

Some of our attributes were converted to more common ship characteristics as we sought platforms to address them. For example, Attribute 3.4.1 (Transportation), was conveyed by helicopter and well-deck characteristics in choosing possible platforms from current inventory. Other ship characteristic "conversions," along with their associated attributes, follow:

- **Communications Suite** (and capability thereof), as well as **CO seniority** characteristics: 1.0.1 Command, Control, Coordination (C3); 2.1.1 Resource Network (Command and Control); 3.1.1 Coordination Center [in addition: 2.4.1-7].
- **Surface-search radar** characteristics: 1.0.2 Regional Maritime Situational Awareness (RMSA).
- **Well deck, davit and crane** characteristics: 1.1.1 Small Boat Operations Support; 1.2.4 Riverine Operations; 2.2.3 Medical Logistics; 2.3.3 Transportation; 3.4.1 Transportation.
- **Messing/berthing** (beyond ship's force) characteristics: 1.1.3/1.1.4 VBSS/SEAL Team (Personnel) Support; 2.1.1 Resource Network (Personnel); 3.3.2 Berthing.

- **Medical facility** (and size of) characteristics: 1.1.6 Medical Support and Transport; 2.2.1 Health Services; 2.2.2 Plans and Operations**.**
- **Helicopter-hanger, helicopter-landing** characteristics: 1.1.8 Helicopter Operations; 2.2.2 Plans and Operations (Patient Movement); 2.3.3 Transportation; 3.4.1 Transportation.
- Topside **crew-served weapons** characteristics, as well as **crew's experience and training in**: 1.2.1 Force Protection.
- **Crew/platform experience in peacetime-engagement functions and missions** (ex: EMIO experience) characteristic: 1.4.1 Training Ability (for Peacetime Engagement related functions).
- **Storage capacity, on-load/off-load (pier-side and offshore),** as well as **ship's draft** characteristics: 2.3.1 Supply; 3.2.1 Storage; 3.4.1 Transportation.
- **Machine shop, services** characteristic: 2.3.4 Civil Engineering; 2.3.5 other Services.
- **Hull color** (black/white versus gray), presence of **conspicuous weapons systems**: 3.5.1 Force Posture.

This particular use of our attributes should not be confused with their primary purpose: to eventually quantify and qualify our mid-level hierarchies via measures, to result in evaluations of our current capability platforms. However, their use in identifying commonly known ship characteristics did help us identify likely assets to be used as GFS systems out of current inventory, and provided a simple method of doing so.

3. Selecting the Platforms, and Their Categories

Brainstorming platform ideas, we developed a list of ship alternatives, along with "pros and cons" for each of them with regard to our desired characteristics (complete list of ship platforms provided in Appendix B). In order to break these options up, we assigned them to group categories that would span a wide variety of system alternatives,

from traditional to non-traditional, from big to small, from single-ship to multi-ship. Selecting one or two alternatives from each category, we hoped to provide a set of ship assets that would account for a broad range of current capability – assets that would stretch our simulation and analysis in all directions, thereby leaving fewer considerations for GFS capability unaccounted for. These categories followed: Cruiser-destroyer (CRU-DES), Amphibious, Military Sealift Command (MSC), Littoral, and Multi-Vessel/Combination. They also effectively addressed our desire to analyze more traditional responses to unfamiliar missions (CRU-DES), non-traditional (MSC), big ships (Amphibious), small ships (Littoral), and multi-ship combinations thereof (Multi-Vessel/Combination).

Figure 27 highlights our list of platforms from which to choose:

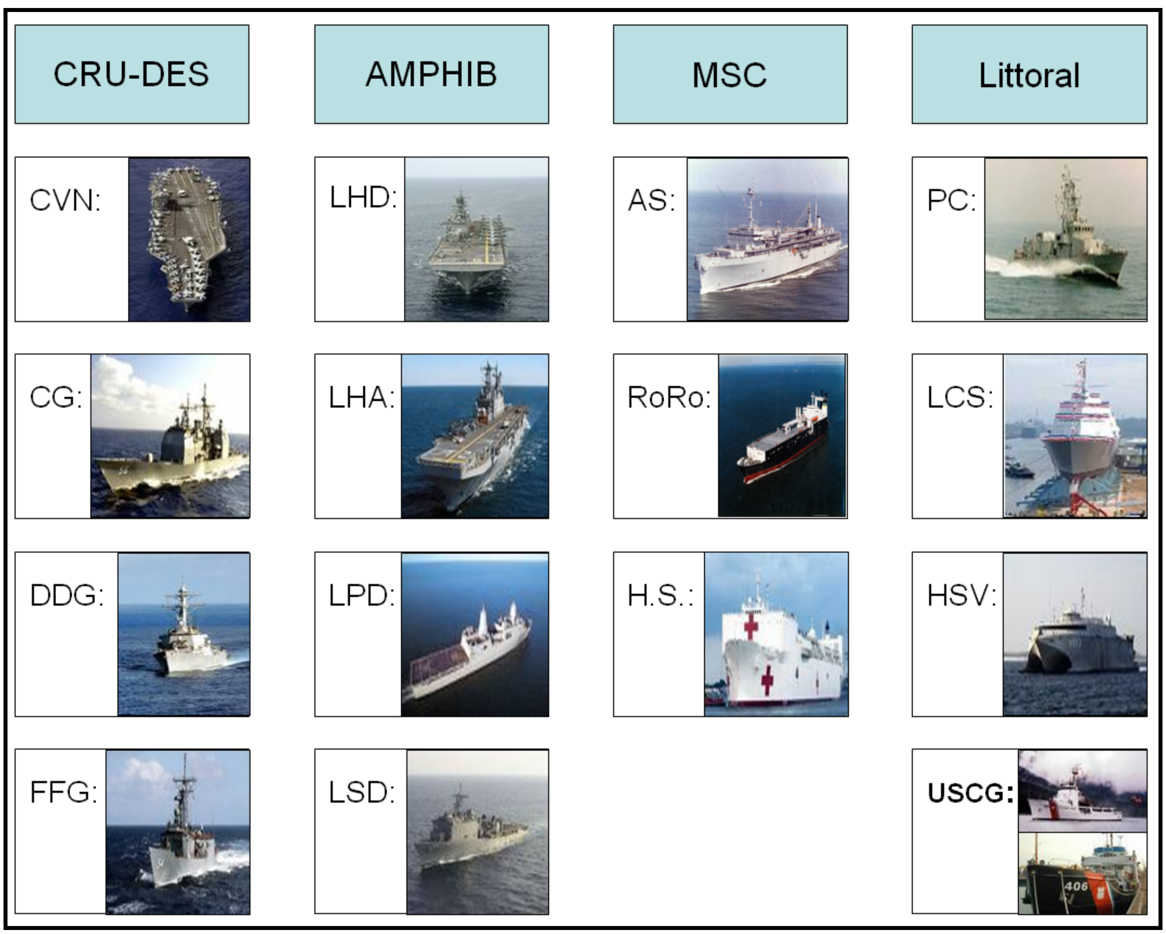

Figure 27: Current Alternatives- Single Ship Proposals

Of note, we included all of the platforms affiliated with pilot programs and associated humanitarian assistance programs among our lists of possible "current capability" options. We used our collective expertise, along with our set of criteria, to determine others.

a. CRU-DES and Amphibious Categories

Our first two categories – CRU-DES and Amphibious – represented traditional Navy response to operational missions, whether those missions are planned as part of the FRP, or in response to crises. Often considered more traditional simply from the aspect that the means by which they achieve their ends often stem via the use or threat of force, they are also the most commonly utilized by combatant commanders when quick responses are required. These are the platforms most equally dispersed across the globe, and for which Operational Control (OPCON) readily lies with those commanders. Speed, mission (land focus for amphibious ships versus maritime focus of CRU-DES), size, and capacity characteristics exclusive to both categories suggested that we keep them separate.

In the CRU-DES category, we included a Nimitz Class (CVN-68) aircraft carrier, a Ticonderoga Class (CG-47) cruiser, Arleigh Burke Class (DDG-51) destroyer, and an Oliver Hazard Perry (FFG-7) class frigate. The CVN represented the ultimate in a sustained and large capability for shaping and stability operations. Though not considered a true CRU-DES platform in the fleet, we included it as part of this category due to its maritime emphasis (vice land – or amphibious - focus). The CG, DDG, and FFG represented a more scaled response, with the cruiser representing the more capable platform with regard to communications, seniority, and surface search capabilities, and the frigate representing the lower end of the spectrum. Force Protection and training ability characteristics were strong points of each platform in this category, as was a helicopter capability.

We incorporated a Wasp Class (LSD-1) multi-purpose amphibious assault ship, a Tarawa Class (LHA-1) multi-purpose amphibious assault ship, a San Antonio Class (LPD-17) amphibious transport dock ship, and a Whidbey Island Class (LSD-41) dock landing ship into the amphibious category. The LHA/LHD platforms offered a

large-scale response capability, with several of the same characteristics as those platforms in the CRU-DES category; in addition, they offered well deck, davit and crane characteristics. We drew the LSD option from one of the pilot programs (FORT MCHENRY), and selected the LPD-17 over other LPD and LSD options due to its modern communications suite.

b. MSC Category

The MSC category represents a non-traditional response to shaping and stability operations. We considered it as such due mainly to operational commander's misunderstanding or narrow view of MSC's scope of capabilities – many Surface Warfare Officer's regard MSC simply as "the folks that refuel our ships-of-the-line at sea." We included it as a category, however, since it offers a wide spectrum of capability that might best address the non-traditional nature of GFS. Beyond the oilers of MSC's Naval Fleet Auxiliary Force (NFAF), a myriad of USNS and commercially leased ships comprise Pre-positioning, Sealift, and Special Mission programs, and may be used in operational and tactical roles by operational commanders. Whether the desired characteristic be the capacity offered by the Sealift and Pre-positioning programs' Long-Range, Medium-Speed, Roll-on/Roll-off (LMSR) vessels, or the speed and shallow draft of the Special Mission program's High Speed Vessel (HSV), MSC affords GFS options. In addition, the lack of conspicuous weaponry, as well as the commercial/non-combatant appearance of all MSC ships, appealed to us as a non-threatening option in a region where political sensitivities may determine the extent of cooperative engagement.

Since MSC vessels span a wide array of appearance and capability characteristics, we attempted to select platforms that represented that variety well. Out of the NFAF program we selected the white-hulled, medically oriented, Mercy Class (T-AH 19) hospital ship. We included a black-hulled ship with a high cargo capacity and RORO off-load (pier-side) capability, the USNS 1st LT Harry L. Martin (T-AK 3015), out of MSC's Prepositioning program. This ship is part of a group of three ships in MSC inventory known as Maritime Prepositioning Force-Enhanced (MPF(E)) vessels. The MPF(E) ships' capabilities exceed those of standard sealift vessels, and may be tailored to include (if outfitted) an expeditionary airfield, Navy Construction Battalion, and fleet

hospital.[118] We did not assume that USNS 1st LT Harry L. Martin had each of these capabilities, and based our quantitative specs for that ship on its current capabilities; however, we did understand that she could be outfitted with these capabilities, which might prove beneficial in our FSA. In addition, though separated within MSC's Prepositioning Program as an MPF(E), and recognized as such by us in our studies, we would continue to refer to this ship by the more generic term of RORO. Planned for transition to MSC prior to 2012, we also included the grey-hulled submarine tender, the USS Emory S. Land (AS 39), primarily for its multi-service and cargo capacity capabilities. Crane off-load (pier-side and offshore) characteristics of the latter two also influenced our decision to include them in the MSC category. In addition, the former two represented options with history, given their affiliation with what we considered to be the pilot programs. HSV Swift, though an MSC vessel, was included in our next category due to characteristics common to that group.

c. Littoral Category

All of our platform options to this point were rather large ships, with the smallest in excess of 500 feet in length; therefore, we included a Littoral category in order to provide platform options to address the berthing and access constraints to several West African ports. In addition, without addressing cost as an independent variable prematurely, we also wanted to provide options to avoid "wasting" capacity out of our current naval inventory. Inherent characteristics to this category of ships included draft, peacetime engagement experience, and force protection.

In the Littoral category, we included a Coast Guard vessel, a Cyclone Class (PC-1) patrol craft, a Freedom Class (LCS-1) littoral combat ship, and the HSV Swift. Regarding the Coast Guard option, we considered it as a basic cutter platform, realizing that its distinguishing characteristics (draft, hull color, peacetime engagement experience, force protection) would pertain regardless of specific hull selection, whether it be a Reliance Class (WMEC 615) medium-endurance cutter or an Balsam Class (WLB-62) buoy tender; if selected, however, we would specify hull type. This particular option

118. Keith Bauer, The Military Sealift Command's Prepositioning Program, power-point presentation, September 2007.

appealed especially for the experience in maritime security and law enforcement inherent to Coast Guard ships and their crews, as well as to the opportunity to flex an interagency aspect of GFS directly out of platform selection. The PC represented the most common small - but ocean capable – platform that we were familiar with. LCS offered a modular aspect to our GFS system: a means to address a dynamic and changing operational environment with tailored packages. The HSV, one of the pilot programs, offered unique cargo capacity and off-loading characteristics not inherent to the other alternatives in this category.

4. Selection Based on Nominal Group Technique

The decisions regarding which single platform to select out of each category varied in nature from "obvious and simple" to "hotly contested." Each ship platform we proposed possessed positive characteristics that we considered important of GFS; but only one would be selected. One of the "easy" selection choices, for example, was the decision to eliminate the aircraft carrier, based on a realization that it was "overkill" with regards to its size and capability, and that its offensive firepower would simply be "wasted" – from a national security sense - in a peacetime role. An example of a contested decision developed out of the discussion regarding the decision between the cruiser and frigate for the CRU-DES category. Advocates of the AEGIS cruiser voiced their concerns about maximizing surface search and communications capabilities in favor of better MDA, whereas the frigate advocates refuted that similar to the aircraft carrier, the cruiser is a national asset and would most likely not be selected for GFS responsibilities. The cruiser advocates highlighted the value-added with its command seniority over that of a frigate – a characteristic considered important due to the relative influence the commanding officer might garner in relations with host-nation and State Department representatives. The FFG advocates highlighted their ship's interchangeability with several foreign navies (as most do not have AEGIS inventories), which would help foster international partnerships to GFS.

Employing the Nominal Group Technique of decision-making, we overcame our debates on ship selection and narrowed our "current capability" alternatives to one platform per category. This technique is one of two expert judgment techniques for

decision-making identified by Dr. Harold Kerzner, and “allows for face-to-face contact and direct communication,”[119] and seemed perfectly suited to our group, as we considered ourselves subject-matter experts given our research, and most of our decisions as a group occurred in the presence of one another. These decisions culminated out of informed votes by our project team, following a brief re-capture of the advantages and disadvantages of each platform (see Appendix B for summary). Our application was liberal, as we did not follow the anonymous voting called for by the technique; however, our briefings of specific platform characteristics did provide for informed decisions.

The votes were simple in nature. Figure 28 depicts how many votes each platform received, as well as the winners of each category (highlighted in green):

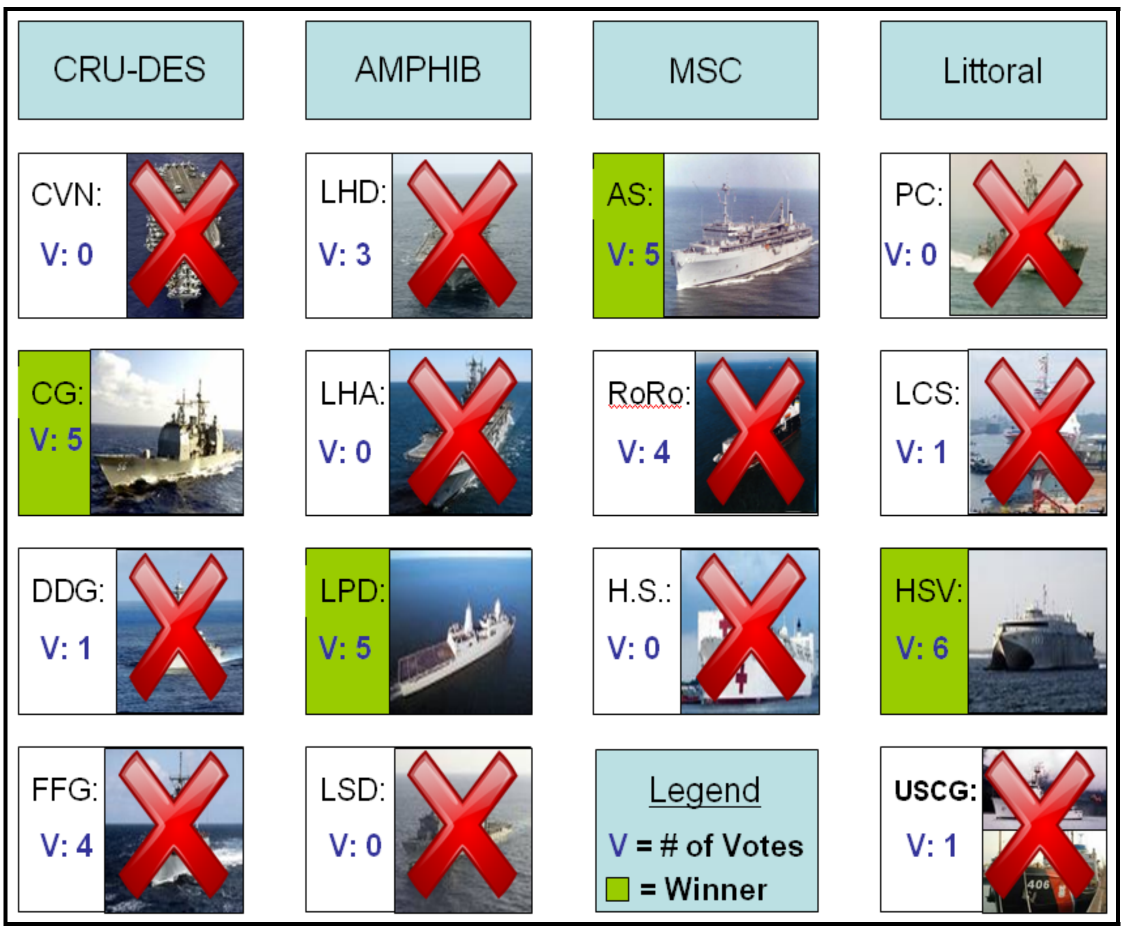

Figure 28: Current Alternatives – Single Ship Selections

119. Harold Kerzner, *Project Management: A Systems Approach to Planning, Scheduling, and Controlling* (New Jersey: John Wiley & Sons, Inc., 2006), 724.

5. Accounting for a Multiple-Ship Alternative: the Combination Category

We also included a multi-ship category. This category addressed a realization that a system alternative – though constrained to ship platforms in our FNA – might consist of more than one vessel. In determining which combinations to utilize, we pulled candidates from the set of single ships already considered. In a few cases, we discovered that using multiple platforms with lesser single-ship capabilities to complement each other resulted in potentially strong combinations. For instance, perhaps the low-maintenance, high capacity RORO, combined with the shallow-drafted and high-speed HSV, might provide the perfect HA/DR combination to get supplies into constrained harbors. Some of these combinations seemed to take on themes, as well: three of them consisted of grey-hulled ships, another just the opposite, and another was consisted strictly of MSC owned hulls. The proposed combinations follow:

Figure 29: Current Alternatives- Ship Combination Proposals

Following a similar Nominal Group Technique, but this time with weighted, anonymous votes, we selected two alternatives out of this category. Each voter ranked their selections on a scale from one to six, which were then tallied by points (I.E. individual's top choice was weighted with 6 points, bottom choice with 1). Figure 30 details the breakouts:

	Voter 1	Voter 2	Voter 3	Voter 4	Voter 5	Voter 6	Voter 7	Voter 8	Voter 9	Total Points
LHD/FFG	4	6	6	6	6	1	5	4	3	41
AS/FFG	5	3	3	3	4	2	3	3	5	31
LCS/HSV	1	5	4	4	3	4	4	1	2	28
Ro-Ro/HSV	6	4	5	5	5	5	6	2	6	44
HS/USCG	2	2	2	2	2	3	2	5	1	21
Ro-Ro/USCG	3	1	1	1	1	6	1	6	4	24

Figure 30: Nominal Group Technique Voting Scores to Select Ship Combinations

The top choices included the grey-hull themed LHD/FFG combination, and the MSC themed RORO/HSV combination. For the former, the combination of communications, capacity, transportation and command characteristics of the LHD, combined with the peacetime-engagement strengths of the FFG proved appealing. For the latter, the MSC combination of a large capacity RORO and ferrying HSV - along with its inherent training, force protection and helicopter characteristics – also faired well, while appealing to the sense that we needed to include a more non-traditional alternative to our study. Of interesting note, the USCG options faired poorly; however, it is apparent that two of the voters felt strongly about the concept of employing a cutter as part of a tandem package (see Voter 6 and Voter 8 votes in Figure 30). Whether service affiliation, designator, or experience of each voter may have influenced such variation remains unknown, as the votes were conducted anonymously.

Figure 31 further highlights our decision.

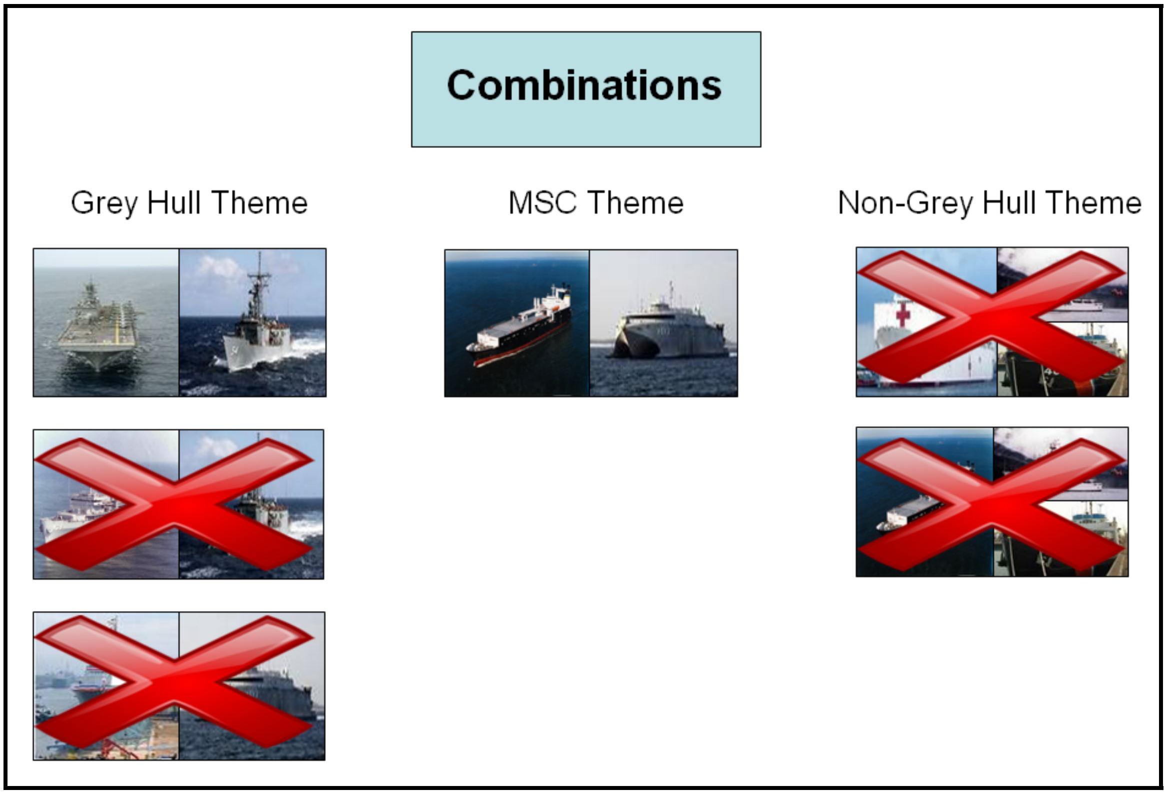

Figure 31: Current Alternatives – Combination Ship Selections

6. Summary of Current Capability Selection

We realized that our platform selections would not satisfy all stakeholders. Indeed, proposing any set of system alternatives often proves to be the most contentious phase of any project. When the decision must be made, it is done so with the baggage of varying human experience, bias and perception. Our group was no different, yet we attempted to make the best decisions possible by utilizing a basic process known as the Nominal Group Technique. Our execution of it varied slightly between our single-ship and multi-ship categorical decisions; but we believe that our results were sound products.

Figure 32 highlights what we determined as "current capability" with regard to system alternatives for GFS:

Figure 32: Final Proposals for GFS Platform Alternatives from Current Capability

Our selections – as is obvious from the above visual depiction – span the possibilities of ship platforms: from traditional to non-traditional, from grey-hull to black-hull, from big to small, new to old, single-vessel to multi-vessel, and fast to slow. We believed that such variety of platforms (and the associated characteristics of each), when simulated or analyzed under the microscope of our three scenarios, would provide a comprehensive measure of the gap between current capability and what is desired from our GFS.

Finally, understanding that these ships embark airborne and water-borne "connectors," such as helicopters and Landing Craft Air Cushion (LCAC) vessels, which might impact further simulation and analysis outcomes in our FNA, we provided a standardized list of ship complements (see Figure 33).

Platform	CG	FFG	HSV	LHD	LPD-17	AS	RO-RO
Water-borne	2 RHIB	1 RHIB	2 RHIB or 2 SURC	2 RHIB 3 LCACs	2 RHIB 2 LCACs	2 RHIB	1 RHIB
Airborne	2 SH-60B	2 SH-60B	1 SH-60B	12 CH-46E 9 CH-53D/E	2 CH-46E	None	None

Figure 33: Connector Complements Aboard Ship Alternatives

B. STOVE-PIPED PROCESS BY MISSION – FOR A REASON

Having commenced our FNA process as a group, we determined that returning to a "stove-piped" approach would help facilitate the progress of our project. As we discovered during our FAA, "traction" – or the ability to make decisions and progress through our studies – proved inherent to working in smaller groups. More importantly, we believed that results of higher quality were achievable by maintaining the expertise accumulated within each top-level mission group: Peacetime Engagement, HA/DR, and Interagency/NGO Coordination. For these reasons, we continued with this theme.

We also developed a plan to combat the primary shortcomings of stove-piped processes. One criticism is that "information may be presented without proper context."[120] Indeed, we recognized this issue soon after developing scenarios. A Peacetime Engagement scenario, with emphasis on counter-piracy, for example, might fail to account for attributes contained within their fisheries enforcement function to the level of recognition that this very important, revenue-impacting, regional issue deserves. To address such concerns, sensitivity analysis was conducted in some cases to determine if a shift in scenario emphasis would significantly impact the grading outcomes of our ship platform alternatives. In addition, our two project managers acted as a common "sounding board" to each group throughout their weighting and scoring processes, assuring that each group maintained similar dispositions toward each endeavor (I.E. none too optimistic, none too conservative, etc…), thus offering a horizontal quality assurance across the vertical stove-pipes of mission scenarios and attributes. We also ensured consistency in attribute and mid-level hierarchy weighting through the use of a standard table (Figure 34).

[120]. Wikipedia, "Stove-piping," http://en.wikipedia.org/wiki/Stovepiping.

	0	N/A
Little to no impact on mission accomplishment	**1**	Minimal importance
	2	
	3	Moderately important
	4	
Mission accomplished with little degradation without asset	**5**	Important
	6	
	7	Very Important
	8	
	9	Absolutely Essential
Cannot perform mission without	**10**	Mission Critical

Figure 34: Weighting Criteria

In cases not adequately addressed by our sensitivity analyses or quality assurance efforts, we simply had to acknowledge that our stove-piped FNA process, with limitations on how complex we could make our scenarios, did have limitations; however, we believed that such shortcomings could be resolved simply by using more comprehensive scenarios and future studies (see Figure 35) . We believed that our process – in itself – remained a sound one.

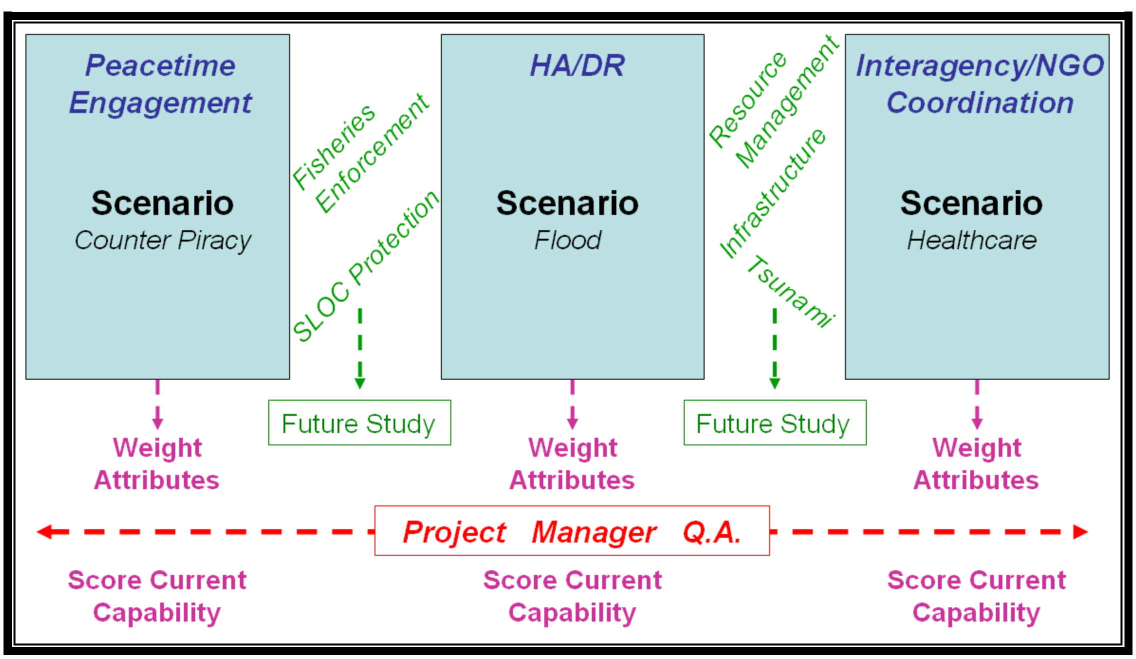

Figure 35: FNA "Game Plan"

C. PEACETIME ENGAGEMENT

1. Scenario Overview

The purpose of the scenario was to provide a realistic context by which to evaluate GFS system alternatives within the specific mission area of Peacetime Engagement. For this reason, the scope of the scenario was limited to "testing" GFS-only capabilities and not those of partner agencies or nations; although it is assumed that the Interagency & NGO Coordination role is intrinsic and will be fulfilled to some extent. Our scenario is set in Nigeria, and we had the distinct privilege of being able to consult Nigerian Military Officer Ibrahim Sani during the development of our scenario. Many assumptions had to be made for which we felt it was important to establish a mutual understanding with our Nigerian counterpart in order to progress with our study; these assumptions will be discussed both here and in Appendix C. It's no secret that the security of Nigeria's petroleum infrastructure, in particular, is important to both of our countries, as well as the political and economic stability of the region as a whole.

a. Scenario Context

That being said, a brief summary of our scenario follows, and is presented in the context of "current day" in the year 2012:

- The GFS is midway through her second deployment to the Gulf of Guinea Area of Operations (AO). She has been conducting multinational exercises with partner nations in the region, and is currently training with a Nigerian Navy vessel in the littoral region of the Niger Delta. Training topics may include small ship and engine maintenance, security of offshore and inshore petroleum infrastructure, conduct of EMIO and Counter Piracy Operations, fisheries protection, or border dispute resolution.
- The threat level has increased in the AO due to recent actions of the Movement for the Emancipation of the Niger Delta (MEND). A small

MEND militia has boarded a Nigerian Shell Oil platform 25 Nautical Miles off the Niger Delta near Bonny Island and stolen hundreds of barrels of petroleum with a small coastal tanker (200-300 ft) and a swarm of 5 fast boats with small arms and rocket propelled grenades (RPGs). The militia has also kidnapped 3 of the Shell workers. It is uncertain whether the hostages are onboard the pirate tanker or one or more of the fast boats.

- It is our assumption that the Nigerian Government, acting through the Minister of Defense, welcomes the cooperative role of GFS and has extended an invitation to train and operate with the Nigerian Navy in territorial waters. Where the capabilities of host nation navies stop, GFS is tasked by AFRICOM to lead the ensuing operation in support of the Nigerian Navy's constitutional role. Nigerian naval officers may be present during the operation for training purposes.

b. Scenario Background, Considerations and Assumptions

The scenarios are not created in a vacuum; they must meet the criteria of realism and likelihood and be intrinsically tailored to the GFS capabilities one wishes to test. In our case, we wished to evaluate the Peacetime Engagement – or military-to-military – mission area. However, to truly flex our system alternatives in order to measure their capabilities, we decided to limit the availability of host nation forces. We did not consider this assumption as adverse to our scenario's realism. Though Nigeria does possess an offshore patrol capability, we believed it important to consider the negligible capability endemic of the region as a whole: Angola, Republic of Congo, Liberia, and San Tome, for example, currently have no offshore capability, and many other nations' offshore vessels are in need of repair.[121] Therefore, for the purposes of the scenario, it was assumed that negligible assistance would be provided by the Nigerian government beyond explicit cooperation and/or a coordination role.

Although U.S. relations with Nigeria do fluctuate with regards to cooperative military to military engagements, it is not an unlikely assumption that

121. Stephen Saunders, ed., *Jane's Fighting Ships 2006-2007* (UK: Cambridge University Press, 2007), 8, 163.

cooperation is in our future. The Nigerian government is a Federal Republic that has had excellent relations with the U.S. since 1999, sharing many of the same foreign policy goals. United States interest in Nigeria is great, as it is the 5th largest supplier of American oil and we are heavily invested in their oil infrastructure (40% of Nigerian oil exports go to the US). Yet, poor corporate relations with indigenous communities, vandalism of oil infrastructure, ecological damage, and security problems in the Niger Delta region hamper growth and reliability of Nigeria's oil throughput.[122]

Our Niger Delta scenario reflects similar attacks that are a recurring threat to the safety and security of the region. MEND has waged an effective campaign against Nigeria's oil industry for nearly 2 years, culminating in a surge of attacks leading up to Nigeria's elections in May of 2007 which targeted oil assets, police armories, and even the Nigerian Military.[123] The newly elected administration took large steps to pacify the militias; however a June 2007 cease-fire ended 3 months later. The most recent attacks at the time of this writing occurred in mid-November 2007 and indicate an escalation in hostilities.[124] The Niger River Delta itself is considerably treacherous as its 20,000 square miles provide ample room for criminals to operate and hide, while most of the 3,000 miles of aboveground pipelines crisscrossing the Delta are significantly vulnerable.

The combination of a training scenario and a Counter Piracy scenario thereby affords an indication of not only which attributes to evaluate with the most scrutiny, but the conditions in which to conduct our modeling, simulation and subsequent assessment.

122. Bureau of African Affairs, "Background Note: Nigeria," U.S. Department of State, http://www.state.gov/r/pa/ei/bgn/2836.htm.

123. Strategic Forecasting, Inc., "Nigeria: MEND Ends the Cease-Fire," http://www.stratfor.com/products/premium/read_article.php?id=295731&selected=Analyses.

124. Dulue Mbachu, "Shell Says Nigeria Pipeline Attacked," http://www.guardian.co.uk/worldlatest/story/0,,-7080597,00.html.

2. Weighting and Scoring of Attributes

a. Overview of Approach

... by tying the capabilities to scenario objectives and a set of CONOPS, you eliminate the problem of trying to assess in terms of capabilities de nusquam[125]*. Early writing on JCIDS often referred to "critical capabilities," implying that there are other capabilities that are not critical. To save yourself a semantic debate, merely state that in your CBA, the critical capabilities are those effects that you have opted to assess in your scenarios.*[126]

For the Peacetime Engagement mission area, we weighted – that is, determined the importance of – each of our attributes based directly on scenario influence. Our most important attributes could be considered to be those graded a 6 (out of 10) or above, and are depicted in Figure 36:

1.0.1 Command, Control, Coordination (C3)
1.0.2 Regional Maritime Situational Awareness (RMSA)
1.1.1 Small Boat Operations Support
1.1.2 Visit, Board, Search, Seizure (VBSS) Team Support
1.1.6 Detainee Coordination
1.1.7 Helicopter Operations
1.2.2 Ordnance on Target (SUW)
1.2.4 Riverine Operations
1.4.1 Training Ability

Figure 36: Most Important Peacetime Engagement Attributes

[125]. Latin, meaning "from nowhere."

[126]. U.S. Office of the Chairman of Joint Chiefs of Staff, *Capabilities-Based Assessment (CBA) User's Guide (Version 2), Force Structure, Resources, and Assessments Directorate (JCS J-8)* (Washington, DC: GPO, 2006): 31.

While the modeling, simulation, and scoring effort (see Appendix C) focused primarily on these highly weighted attributes, a value score was assigned to every platform for all attributes. This was accomplished by developing criteria or measures for each attribute for which a value score (out of 100) could be assigned for how well each system alternative (i.e. platform or combo) performed in that attribute. In some cases there was more than one measure of performance for an attribute, but each value score was arrived at by way of a value assessment based on the criteria described below. While a specific value function was not defined for each attribute, the assessment was objectively based on each alternative's organic capabilities. From the Joint Chiefs of Staff Capabilities-Based Assessment Guide:

> Too many DEPARTMENT OF DEFENSE analyses get hung up over establishing precise, coordinated, acceptable-to-all numbers for such things as the probability of kill for a weapon or the survivability of a platform. You can either 1) endure endless arguments over what the correct estimate should be, or 2) document the range of legitimate opinions on the numbers and assess the extremes to see if the estimate really matters to your overarching measures.[127]

"The extremes" that the CBA guide refers to were assessed in our sensitivity analysis and documented below.

Our assessment did not stop there. One approach to determining current capabilities that the CBA Guide outlines is collecting and documenting doctrinal approaches by way of a working group:

> You should give your group the set of scenarios and the capabilities you've derived from those scenarios, and have them tell you how they would achieve those effects …

127. U.S. Office of the Chairman of Joint Chiefs of Staff, *Capabilities-Based Assessment (CBA) User's Guide (Version 2), Force Structure, Resources, and Assessments Directorate (JCS J-8)* (Washington, DC: GPO, 2006): 44.

Essentially, you are giving your working group a mission order. You want them to tell you how they would do the mission, particularly:

• What force elements they would use;

• How long it would take;

• What the sequencing of tasks and dependencies among tasks would be; and

• What sort of basing, transport, and allied cooperation would be required.[128]

We were fortunate to have the Commander of Naval Special Warfare Group Four (NSWG4) offer his support in this effort. Teams of requirements analysts headed by Mr. Matthew Hawkins were able to broaden our analysis and add validity by delivering their approach to our Peacetime Engagement scenario. The NSWG4 analysis acts as a complement to our overall assessment approach and a supplement to our evaluation of alternatives in the attributes of Riverine Operations and Equipment Storage (see attribute 1.2.4 and 1.1.4 below).

b. Attribute Outcomes

The resulting scores of our attributes follow.

1.0.1 Command, Control, Coordination (C3): The ability to exercise authority and direction by a properly designated commander over assigned and attached forces in the accomplishment of the mission. A commander performs command and control functions through an arrangement of personnel, equipment, communications, facilities, and procedures to plan,

[128]. U.S. Office of the Chairman of Joint Chiefs of Staff, *Capabilities-Based Assessment (CBA) User's Guide (Version 2), Force Structure, Resources, and Assessments Directorate (JCS J-8)* (Washington, DC: GPO, 2006): 44.

direct, coordinate, and control forces and operations in the accomplishment of the mission.[129]

Overall Weight: 8

A robust C3 capability is a necessity in order to smoothly control and execute multiple mission areas simultaneously, as well as communicates with our host countries. In our scenario the GFS started out conducting training with Nigerian forces; this requires C3. As the scenario progresses the GFS must be able to conduct helicopter operations, small boat operations, and non-compliant boarding (NCB), all while tracking a MEND oil tanker as well as MEND small boats, and coordinating with Riverine Forces operating in the Niger Delta. In order for the mission to succeed, many of these functions must occur simultaneously, while others must be ensured a seamless transition from one to another; for all of this C3 is an inherent necessity.

1.0.1.1 C3 Connectivity: GFS shall have joint, interoperable C3 capability such that it has complete and uninterrupted connectivity with appropriate joint forces and Naval Force (NAVFOR) maritime force protection networks; the GFS crew and embarked personnel will be able to maintain situational awareness and adjust planning during transits.

Weight within Attribute: 70%

1.0.1.2 C3 Integration: GFS shall have computing capabilities that integrate sensors, communications, and self-protection weapon systems into a single command and control system.

Weight within Attribute: 30%

Value Scoring Criteria: As a forward operating base, the GFS should have the following command, control and coordination (C3) capabilities:[130]

129. U.S. Joint Requirements Oversight Council, *Joint Capability Areas Tier 1 & 2 Lexicon* (Washington, DC: GPO, 2006): 30.

130. Tactical Bulletin GWOT-06-02 Afloat Forward Staging Base for Maritime Security Operations From LSD and LPD Class Ships, March 2006.

- Combined Enterprise Regional Information Exchange System (CENTRIXS); an essential capability for coalition and multinational operations.

- Automatic Identification System (AIS); necessary to allow for greater situational awareness and building of the User-Defined Operational Picture (UDOP). All ships assigned MIO/EMIO operations are outfitted with AIS.

- C3 Suite; to accommodate possible embarked staffs or parallel operations, the TACLOG space can be converted into a C3 suite, by patching additional C2 circuits into the space, establishing multiple SECRET Internet Protocol Router Network (SIPRNET) workstations, multiple CENTRIXS workstations, and a Global Command and Control System (GCCS) terminal with a C2 personal computer (PC).

- Link 16; this capability would allow for faster transmission of data between the helicopters, other USN vessels, and many partner nations. A minimum criterion is Link 11.

- A capability level was assigned to each GFS alternative based on its organic C3 systems and capacity for acting as a C3 hub. A fully capable and expansive C3 platform was designated as Level 1 (100%), Level 2 (80%) if C3 capacity was limited, and Level 3 (60%) was established as a baseline for limited capability.

Value Scores:

CG: Value Score of 100% - Level 1; meets all criteria.

LPD-17: Value Score of 100% - Level 1; meets all criteria and has a ship's signals exploitation space (SSES)/joint intelligence center (JIC) space onboard.

HSV: Value Score of 80% - Level 2; HSV is limited in C3 suite capability and does not have Link 11 or 16.

AS: Value Score of 80% - Level 2; similar to HSV.

LHD/FFG: Value Score of 100% - Level 1; the LHD/FFG combination benefits from the greater capability of the C3 suite on a LHD (Level 1). The FFG has an improved Level 2 capability with Link 11 and SIPRNET.

HSV/RORO: Value Score of 80% - Level 2; the HSV/RORO combination benefits from the greater capability of the HSV, because the RORO scores a 60% (Level 3) with the following baseline systems: VHF (bridge-to-bridge), UHF (FLTAC), GMDSS/INMARSAT C, INMARSAT B (voice & data), Classified Message Transfer System, AIS, and Ship Security Automated Systems (SSAS). The RORO has no CENTRIX, SIPRNET, GCCS, Link 11 or 16.

1.0.2 Regional Maritime Situational Awareness (RMSA): the ability to develop awareness and understanding of anything associated with a maritime area of concern (AOC) that could impact regional security, safety, economy or environment and to produce intelligence through persistent and pervasive observation of the AOC. This includes meteorological data and event warning. Actionable intelligence is key.[131]

Overall Weight: 8

RMSA was given a high weight not only for its importance in the scenario, but also for its general applicability to the higher-level missions

131. U.S. Joint Requirements Oversight Council, *Joint Capability Areas Tier 1 & 2 Lexicon* (Washington, DC: GPO, 2006): 23.

and many of the other attributes. RMSA, as an attribute, pervades all mission areas and is a fundamental building block for any operational capability.

1.0.2.1 RMSA Planning: GFS shall have the ability to develop intelligence requirements and build a collection plan for a regional area of concern (AOC), and function in accordance with the MHQ w/MOC CONOPS**.**

Weight within Attribute: 10%

1.0.2.2 Monitoring and Tracking: GFS shall have the ability to persistently monitor in the local maritime domain: vessels & craft, cargo, crews & passengers, areas of interest. GFS and/or partner nations shall determine the number of all vessels underway in a specific area of concern (AOC) and track those vessels**.**

Weight within Attribute: 20%

1.0.2.3 Identification: GFS and/or partner nations shall have the ability to identify all cargo, crew, and passengers on vessels underway in a specific AOC.

Weight within Attribute: 10%

1.0.2.4 Threat Detection: GFS and/or partner nations detect potential threats associated with all vessels underway in a specific AOR.

Weight within Attribute: 30%

1.0.2.5 Support UDOP: GFS shall have the ability to make information and intelligence available to support the User-Defined Operational Picture (UDOP) in support of the MHQ w/MOC CONOPS.

Weight within Attribute: 10%

1.0.2.6 RMSA Cooperation: GFS, as a Regional Maritime Situational Awareness (RMSA) node, shall have the ability to disseminate information to the appropriate members of the interagency community and partner nations. GFS shall have the ability to foster cooperation among maritime security providers in host

nations and incorporate their contribution to the unclassified RMSA network.

Weight within Attribute: 10%

1.0.2.7 Cultural Awareness: GFS shall have the ability to understand the cultural context in which operations take place, including the culture of coalition partners, host nations, civilian organizations and agencies**.**

Weight within Attribute: 10%

Value Scoring Criteria: The RMSA score is based on measuring the sub-attributes of *threat detection* and *monitoring and tracking*, which together account for 50% of the RMSA attribute. The remaining half is accounted for by *RMSA planning, identification, UDOP support, cooperation, and cultural awareness*, which are assumed to be consistent across all platforms as they are functions of staff, training, external support and computing. For the *threat detection* and *monitoring and tracking* measures, we utilized the NSS simulation described in Appendix C, and with results listed in Figure 37 and Figure 38. The results consisted of 4 measures: detection time and range for the ships and any organic helicopter assets. That is, the *time* and *range of detection* from scenario start until the RED tanker was acquired.

For each GFS platform, the simulation was run 70 times with a specification of less than 5% standard deviation. 70 replications were enough to ensure that this requirement was met. Mean values are reported here.

Each GFS alternative was graded according to the performance in the scenario. The NSS scenarios produced MOEs of time to detection of the MEND Oil tanker and distance the MEND Oil tanker was detected for the GFS platform as well as the helicopters utilized, if the platform is capable of helicopter operations. Utilizing the “Scenario MOE” table and graph we assigned grades to each GFS platform and helicopter based on

performance; the quicker and further away the MEND Oil tanker was detected the better. The final value score was calculated using the following formula:

$$\text{Final Value Score} = \left(\tfrac{2}{3}\right) \textit{GFS Platform Score} + \left(\tfrac{1}{3}\right) \textit{Helicopter Score}$$

We utilized this formula after determining that we valued the performance of the platform twice as much as the value of the helicopter.

Value Scores:

CG:	96.7% - based on MOE results and graphical representation.
LPD-17:	76.7% - based on MOE results and graphical representation.
HSV:	93.3% - based on MOE results and graphical representation.
AS:	40.0% - based on MOE results and graphical representation.
LHD/FFG:	91.7% - based on MOE results and graphical representation.
HSV/RORO:	93.3% - based on MOE results and graphical representation.

Platform	Distance	Time
CG	21.70	4.52
LPD	21.70	5.63
HSV	19.25	3.80
AS	21.60	6.24
FFG/LHD	19.25	4.60
HSV/RORO	19.25	3.80
CG Helicopter	29.85	3.10
LPD Helicopter	15.00	6.30
HSV Helicopter	18.80	4.70
FFG/LHD Helicopter	18.07	2.00
HSV/RORO Helicopter	18.70	4.70

Figure 37: P.E. Time-Distance Table

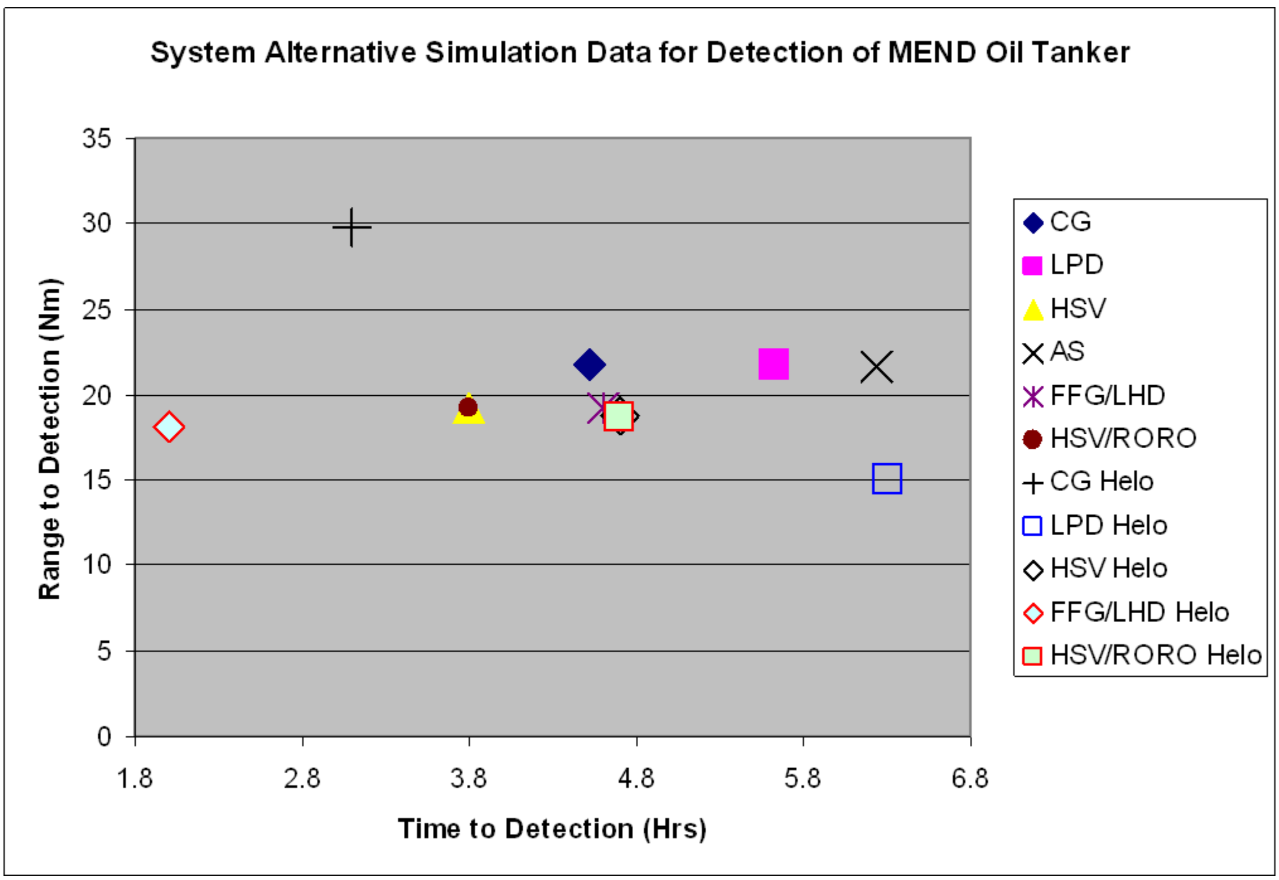

Figure 38: Graphical Representation of RMSA Performance

1.1.1 Small Boat Operations Support:

1.1.1 Small Boat Operations Support: GFS shall be able to conduct Small Boat Operations, including the ability to embark, disembark, store, maintain, and repair small boats (RHIB or required alternative). GFS shall be able to maintain communication with Small Boat Operations and other expeditionary teams (VBSS and SEALs).

Overall Weight: 7

Small Boat Operations for a GFS platform was deemed essential for a majority of the attributes including training, fisheries regime enforcement, logistics, and others. EMIO and MSOC could not be accomplished effectively without the ability to conduct small boat operations.

Value Scoring Criteria: The scoring for Small Boat Operations Support is based on the type and number of small boats that are available on each platform. A minimum of 2 RHIBs are necessary in order for a NCB VBSS Team to board a vessel quickly without having to wait for the RHIB to make two trips (thus decreasing the safety of the VBSS Team). We also determined that due to age, performance, and composition we would not consider motor whale boats (MWB) to be as useful for NCB VBSS operations as a RHIB. In the case of the FFG/LHD combo we determined that the FFG would be the EMIO platform; and in the case of the HSV/RORO the HSV would be the EMIO platform.

Value Scores:

CG:	100% - has a minimum of 2 RHIBs embarked.
LPD-17:	100% - has a minimum of 2 RHIBs embarked.
HSV:	100% - has a minimum of 2 RHIBs embarked.
AS:	40% - has 2 motor whaleboats embarked.
LHD/FFG:	80% - has 1 RHIB embarked on the FFG as the EMIO asset.
HSV/RORO:	100% - has a minimum of 2 RHIBs embarked.

1.1.2 Visit, Board, Search, Seizure (VBSS) Team Support: GFS shall be able to transport, house, and sustain VBSS Team members.

Overall Weight: 8

Piracy and smuggling by armed militants are two major causes of instability in the Gulf of Guinea region. If the GFS were to help eliminate or decrease the instances of these crimes, the overall value of the GFS platform in the region would increase. The ability of the GFS to support VBSS Teams is instrumental in combating these problems.

Value Scoring Criteria: VBSS Team Support was scored by determining if the platform was capable of transporting, housing, and sustaining VBSS personnel based on current configurations and operations procedures.

Value Scores:

CG:	100% - fully capable.
LPD-17:	100% - fully capable.
HSV:	100% - fully capable.
AS:	100% - fully capable.
LHD/FFG:	100% - fully capable.
HSV/RORO:	100% - fully capable.

1.1.3 Sea, Air, Land (SEAL) Team Support: GFS shall be able to transport, house, and sustain SEAL Team members.

Overall Weight: 5

Piracy and smuggling are two causes of instability in the region. If the GFS were to help eliminate or decrease the instances of these crimes, the overall value of the GFS in the region would increase. SEAL Teams are capable of combating these problems when a VBSS Team is not capable of doing so.

Value Scoring Criteria: SEAL Team Support was scored by determining if the platform was capable of transporting, housing, and sustaining SEAL personnel based on current configurations and operations procedures.

Value Scores:

CG: 100% - fully capable.

LPD-17: 100% - fully capable.

HSV: 100% - fully capable.

AS: 100% - fully capable.

LHD/FFG: 100% - fully capable.

HSV/RORO: 100% - fully capable.

1.1.4 Equipment Storage: GFS shall be able to securely store EMIO and/or SEAL Team armament; GFS shall be able to store associated maintenance and support equipment.

Overall Weight: 4

VBSS and SEAL teams require a significant compliment of equipment and armament that have specific requirements for housing and storage onboard the GFS. Without the ability to store equipment or provide the necessary security, the teams would not be able to accomplish their missions.

Value Scoring Criteria: The equipment storage attribute is scored based on each platform's cargo capacity, including storage of small boats and associated maintenance and support equipment. Armament storage has specific security requirements that may add additional personnel and equipment for ships that are not otherwise outfitted with adequate armory capacity.

Value Scores:

CG: 100% - fully capable.

LPD-17: 100% - fully capable.

HSV: 100% - fully capable.

AS: 60% - value lowered due to small boat storage issues and lack of RHIBS.

LHD/FFG: 90% - value lowered due to 1 RHIB storage capability.

HSV/RORO: 75% - value lowered due to lack of small boats and armory on RORO.

1.1.5 Medical Support and Transport: GFS shall be able to provide medical treatment to embarked personnel and/or able to transport personnel to other facilities for medical treatment.

Overall Weight: 4

GFS will be involved in counter piracy, NCB VBSS, and possibly SEAL operations. These types of operations are inherently dangerous. As a result GFS needs the ability to provide medical treatment or the ability to transport personnel rapidly by air to other facilities for medical treatment. It was not ranked higher because GFS is meant to conduct Phase 0/shaping and stability operations and is not expected to be involved in full combat operations where significant injuries or casualties would be sustained.

Value Scoring Criteria: To determine the grade for Medical Support and Transport, the platform's medical capabilities, as well as their capabilities to transport personnel to other facilities, were utilized. The ideal platform has a complete medical compliment onboard capable of conducting the full spectrum of medical procedures. If this is not possible, the ability to quickly transport personnel to a capable medical facility is the next best alternative.

Value Scores:

CG: 50% - 3 Corpsman, limited medical beds (~3), helicopter, and speed.

LPD-17: 100% - fully capable; 2 operating rooms, no post-op beds, 4 bed ISO ward, 24 bed ward, 100 bed surge, doctor & dentist, helicopters.

HSV: 50% - 1 or 2 Corpsman, limited medical beds (folding operating table), helicopter, and speed.

AS:	60% - limited speed but some medical capabilities; no operating rooms, 6 bed ward, x-ray, lab, 3 doctors & dentist, no helicopter.
LHD/FFG:	100% - LHD fully capable; 6 operating rooms, 18 post-op beds, 6 bed ISO ward, 36 bed ward, 600 bed surge, doctor & dentist, helicopters.
HSV/RORO:	50% - Corpsman, limited medical beds, helicopter, and speed.

1.1.6 Detainee Coordination: GFS shall be able to transport, house, sustain and/or coordinate the exchange of detainees/suspected terrorists.

Overall Weight: 6

While conducting Counter Piracy, Anti-Smuggling, or GWOT operations, the ability to coordinate the transport, housing, and sustainment of detainees is paramount.

Value Scoring Criteria: The platforms were evaluated on their suitability for coordinating detainees. A full brig (naval jail) is not necessary as long as the GFS is able to create a suitable detainee holding area as well as sustain them until transfer. Each platform has the flexibility to establish a secure, makeshift brig onboard. For instance, the FFG can utilize the area beneath the main mast as a detainee holding area and the CG can utilize the port/starboard break as a holding area.

Value Scores:

CG:	100% - fully capable.
LPD-17:	100% - fully capable.
HSV:	100% - fully capable.
AS:	100% - fully capable.
LHD/FFG:	100% - fully capable.
HSV/RORO:	100% - fully capable.

1.1.7 Helicopter Operations: GFS shall be able to conduct helicopter launch, recovery, storage, communication, maintenance, and support operations. Helicopter operations also support core competencies such as search and rescue operations.

Overall Weight: 7

Rapid and seamless helicopter operations are one of the key enablers for the GFS platform to accomplish a variety of missions. Helicopter operations are essential tools for VBSS operations, training, fisheries regime enforcement, re-supply, and other logistics tasks. Additionally, helicopter sensors improve each platform's detection range and intercept time, thereby enhancing the RMSA capability.

Value Scoring Criteria: A platform was scored based on the number and type of helicopters it was capable of launching, recovering, storing, maintaining, and supporting. Due to the nature of our operations and its design, the SH-60B was our ideal asset, while having 2 onboard was the ideal configuration (maintenance rates dictate that having 2 helicopters ensures a much higher probability that at least one will be operationally available at all times). Though two helicopters was considered ideal, we factored that any capability less than that, but greater than zero, was 80% capability, out of an assumption that even one aircraft would be operational most of the time, or that a CH-46 could perform missions such as SAR, but might be slightly less capable as they were not our ideal platform.

Value Scores:

CG: 100% - fully capable; 2 SH-60 helicopters.

LPD-17: 80% - capable for 2 CH-46 helicopters.

HSV: 80% - capable for 1 SH-60 helicopter (no ordnance).

AS: 0% - cannot launch, recover, store or maintain a helicopter.

LHD/FFG: 100% - fully capable; no additional value obtained from extra helicopters.

HSV/RORO: 80% - capable for one SH-60 on the HSV; RORO is only landing capable.

1.2.1 Force Protection (Underway): GFS shall use protective positions, measures, or equipment to reduce the effects of enemy and friendly weapon systems and to enhance force effectiveness. This activity physically protects the GFS against acts designed to impair its effectiveness and to retain the unit's capability to perform its missions and tasks. It includes employing local security and protective positioning of equipment. While moving, GFS will employ a variety of movement techniques designed to enhance protection (e.g., the use by maritime forces of convoys, circuitous routing, dispersal and defensive formations, and zigzag plans; includes the use by naval aircraft of routing and formations that enhance self-protection, plus individual aircraft jinking techniques). The task includes providing for passive defense in a nuclear/biological/ chemical (NBC) - chemical/biological/radiological (CBR) environment. (JP 1, 3-0, 3-02, 3-03, 3-01.4, 3-11, 3-13, 3-15, 3-51, NDP 1, 4, NWP 3 Series, FMFM 13)

Overall Weight: 5

A robust Force Protection capability is a necessity in order to smoothly control and execute multiple mission areas simultaneously while ensuring the safety and defense of the GFS. The ability of the GFS platform to protect itself is a core competency in the USN. If the GFS was not capable of protecting or defending itself it would then become a liability in the region it is supposed to be helping. Force Protection was weighted at a five due to the MEND capabilities. Since MEND is a relatively small militant group with limited armament and capability they do not pose a significant threat to the GFS platforms. This is consistent with the larger theme that GFS will be faced with at most theater security operations.

1.2.1.1 Force Protection In-port (Pier-side): GFS shall be able to employ organic or host nation protective measures pier-side for the protection of the unit. This task includes protecting friendly forces within a designated geographic area; harbors, approaches, or anchorages against external threats, sabotage, subversive acts, accidents, theft, negligence, civil disturbance, and disasters. (JP 3-0, 3-10, 4-0, 4 01.5, 4-04, MCWP 3-41.1, NDP 1, NWP 3-10 Rev A, 3-10.3, NTTP 3-07.12)

Weight within Attribute: 20%

1.2.1.2 Force Protection at Anchor: GFS shall be able to employ organic or host nation protective measures while at anchor or moored to a buoy to protect against external threats, sabotage, subversive acts, accidents, theft, negligence, civil disturbance, and disasters. (JP 3-0, 3-10, 4-0, 4 01.5, 4-04, MCWP 3-41.1, NDP 1, NWP 3-10 Rev A, 3-10.3, NTTP 3-07.12)

Weight within Attribute: 20%

1.2.1.3 Active Defense: GFS shall have a capability to defend itself against air, surface, and missile attack. The ability to track and destroy low slow flyers will be a priority capability. Self-defensive capabilities should be tailored to the threat environment so as not to require additional assets from a strike group. (NSDM - NSP 11-4/12-6)

Weight within Attribute: 30%

1.2.1.4 Passive Defense: GFS shall employ measures to minimize vulnerability and/or negate the effects of WMD or NBC employed against the unit**.**

Weight within Attribute: 30%

Value Scoring Criteria: The scenario does not dictate a need for Force Protection while in port or at anchor. However, we wish to evaluate each platform's Force Protection capability independent of the scenario. This

poses a problem in that any measure of Survivability must take into account the *operating environment*, the *threat*, and the *mission*. Measuring Survivability can be as complex or as simple as required; it's a function of many factors and can be decomposed into unlimited probabilities. For Naval vessels, we distill the various components into three broad categories: susceptibility, vulnerability, and recoverability. Organic weapons systems, maneuverability, hull composition, ship type (warship vs. auxiliary ship), and threat capability (systems and training) was also taken into account while conducting our grading.

While additional small boat capability adds to force protection capability, we are not presuming to measure that capability in our modeling and simulation. For instance, the Africa Partnership Station (GFS pilot program) USS Fort McHenry (LSD 43) is taking on two 25' Boston Whalers and two 25' catamaran security boats, one LCU, and two MIKE 8 boats.[132] The range of possible uses for these craft precludes all but a general assumption that FTM would have an enhanced force protection capability.

Value Scores:

CG: 100% - fully capable.

LPD-17: 100% - fully capable.

HSV: 90% - lacks firepower of a CRUDES platform but is highly maneuverable.

AS: 80% - lacks firepower of a CRUDES platform but is still capable.

LHD/FFG: 100% - fully capable.

HSV/RORO: 65% - the RORO is not capable for protection itself and is not maneuverable; as a result the overall score is lowered.

132. Gejuan Sweat, email message to the authors, October 19, 2007.

1.2.2 Ordnance on Target (Surface Warfare): The ability for GFS to use the environment, geography, disposition of forces, passive or active sensors, maneuvering, and coordination of weapons to damage or destroy an enemies capability before the enemy is in a position to harm the GFS or mission.[133]

Overall Weight: 6

GFS has been envisioned and defined as a platform or system of platforms that will operate in phase 0 environments. The reality of modern naval operations and cooperative maritime security within the global community has called for an increased vigilance and action by military ships and aircraft in the fight against piracy and armed robbery in various parts of the world. Though intended for a different part of the continent, a statement by the U.N.'s International Maritime Organization "encourages member States whose naval vessels and military aircraft operate in international waters and airspace adjacent to the coast of Somalia to be vigilant to any incident of piracy therein and to take appropriate action to protect merchant shipping, in particular the transportation of humanitarian aid, against any such act, in line with relevant international law."[134] With a growing trend toward active participation by surface assets against pirates, we believed that a ready component for force – if called upon and if requested by host nations – remained an essential component of GFS.

The International Maritime Bureau (IMB) reported that piracy and armed robbery attacks against ships rose 14% in the first nine months of 2007 compared to the same period in 2006, the second consecutive quarterly increase in attacks, as the coastal waters off Nigeria and Somalia became ever more dangerous.[135]

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133. U.S. Joint Requirements Oversight Council, *Joint Capability Areas Tier 1 & 2 Lexicon* (Washington, DC: GPO, 2006): 3.

134. International Maritime Organization, "Security Council urges action over piracy off the coast of Somalia in line with IMO Assembly resolution," http://www.imo.org/TCD/mainframe.asp?topic_id=1347.

135. ICC Commercial Crime Services, "Piracy attacks rise 14% as Nigerian and Somalian coasts become more dangerous," http://www.icc-ccs.org/main/news.php?newsid=95.

In keeping with the spirit of the U.N.'s statement, the USN had responded with an increased presence off Somalia to counter piracy and armed robbery attacks on distressed merchant vessels. Recent operations against suspected pirates and hijackers have resulted in warning shots and surface engagements by USN combatants. These engagements against suspected pirate vessels require robust firepower and armament. The Navy's ability to conduct surface warfare and engage enemy maritime targets in the world's troubled waters remains a key war-fighting capability that a GFS platform must retain to remain effective in the Gulf of Guinea.

Value Scoring Criteria: The capability of the platform to conduct surface warfare when confronted with an enemy was utilized here. Armament, maneuverability, as well as if the ship was designed to conduct this mission was taken into consideration.

Value Scores:

CG:	100% - fully capable.
LPD-17:	95% - fully capable, less maneuverable.
HSV:	90% - lacks firepower of a CRUDES platform but is highly maneuverable.
AS:	80% - lacks firepower of a CRUDES platform but is still capable.
LHD/FFG:	95% - fully capable, maneuverability of LHD lowers score.
HSV/RORO:	50% - the RORO is not capable to conduct this mission and is not maneuverable; as a result the overall score is lowered.

1.2.3 Protection of Sea Lines of Communication (SLOC): The ability to conduct activities or operations to protect sea routes that connect the GFS with its sources of sustainment.[136]

Overall Weight: 3

A core competency for any USN combatant is the ability to protect the sea base's re-supply routes. The GFS must be able to protect the SLOC in order to remain on station and ensure vessel access to port facilities and waterways, to maintain projection of assets, and ultimately protect U.S. national interests. Without the ability to protect its own SLOC the on-station time of the GFS degrades and as a result the GFS becomes ineffective.

Value Scoring Criteria: The protection of SLOC for re-supply routes over water to the GFS in the Gulf of Guinea region is limited to deterring and preventing small boat attacks by pirates and militants on replenishment assets in the AO. The GFS alternatives have been scored objectively according to their weapons systems and ability to respond in a timely manner to protect regional SLOC.

Value Scores:

CG:	100% - fully capable.
LPD-17:	100% - fully capable.
HSV:	100% - fully capable
AS:	70% - slow speed, poor maneuverability, and lacks the firepower of a CRUDES platform.
LHD/FFG:	100% - fully capable.
HSV/RORO:	70% - the RORO is not capable to conduct this mission and is not maneuverable or fast; as a result the overall score is lowered.

136. U.S. Joint Requirements Oversight Council, *Joint Capability Areas Tier 1 & 2 Lexicon* (Washington, DC: GPO, 2006): 4.

1.2.4 Riverine Operations: GFS shall have the ability to support and/or coordinate operations that cope with and exploit the unique characteristics of a riverine area, to include locating/destroying hostile forces and achieving/maintaining control of the riverine areas. These operations will suit the nature of the specific riverine area in which operations are to be conducted.[137]

Overall Weight: 8

In Riverine Operations we considered not only the scenario but also the state of the Gulf of Guinea, specifically Nigeria. For the scenario several MEND fast boats that have kidnapped oil works are able to escape into the Niger Delta. Having a riverine force with which the GFS is capable of coordinating is essential for dealing with the pirate threat. The Niger Delta is an area of instability as a result of pirate activity and MEND being able to operate nearly unopposed.

Any emphasis on the need for riverine forces should be interpreted as a recommendation only. For the purposes of the scenario, it should be assumed that a Nigerian riverine capability is the most appropriate response. Alternatively, we considered that the implications of U.S. Riverine Forces supported by GFS are beyond the scope of our study. Whether or not it is directly supported by GFS, riverine units will require coordination from GFS during counter piracy operations, assuming her draft is too deep to enter the smaller Delta tributaries. However, use of U.S. riverine forces may imply an escalation in conflict level beyond the scope of GFS regional objectives.

Value Scoring Criteria: For GFS to be a viable instrument in regional shaping and stability operations a robust Riverine force is a necessity; however, GFS can contribute by acting as a C3 hub for the Riverine forces and help keep them supplied with stores, parts, and other resources they

19. U.S. Joint Requirements Oversight Council, *Joint Capability Areas Tier 1 & 2 Lexicon* (Washington, DC: GPO, 2006): 5.

may need in order to perform their mission; as a result these value scores are the same as those of C3.

Value Scores:

CG:	100% - Level 1.
LPD-17:	100% - Level 1.
HSV:	80% - Level 2.
AS:	80% - Level 2.
LHD/FFG:	100% - Level 1.
HSV/RORO:	80% - Level 2.

Attribute Summary: Based on our scenario, the following list of required assets for a Special Operations/Riverine Force came from Naval Special Warfare Group Four (NSWG4). These requirements are presented in Figure 39 as a recommendation only, and were not used as evaluation criteria:

Boats
(2) SOC-R (33ft x 9ft, 20,000 lbs loaded)
(2) NSW RIB (36ft x 10.6ft, 17,400 lbs empty)
Helo Support
(2) H-60B (Helo Assault Force)
(2) H-60B (Sniper Overwatch)
UAV Support
(2) Aqua Puma (8.5ft x 6ft, 12 lbs)
Personnel
(10) SWCC (Riverine Detachment)
(8) SWCC (Coastal Detachment)
(16-32) SEAL (1-2 SEAL Platoons)
(5) ASO qualified personnel
(1) UAV operator
(4) Sniper support (assigned to Helo Assault Force)
Communications Equipment
(1) Full mobile comms team support package (8ft x 8ft x 8ft)
Logistic Support
Berthing for all passengers
Food for all passengers
Ammo (5.56, 9mm, 7.62, 7.62 mini gun, .50 cal, 40mm/MK-19)
Diesel fuel (3-5k gal minimum)

Figure 39: NSWG4 Recommended Capabilities[138]

138. SeaPower Magazine, "Surface Craft," http://www.highbeam.com/doc/1P3-1234487911.html.

The requirements analysts at NSWG4 were aware of the difficulty of employing or coordinating these assets from GFS, and acknowledged that it "would not be ideal for SOF forces to be embarked on a vessel just waiting to be called into action. There are options to consider:

- MCADS drop (Maritime Craft Aerial Deployment System) – Special Forces and boats airdropped out of C-130 (or other aircraft) into Area of Operations (AO).
- Boats deploy from Forward Operating Base (FOB) and rendezvous with GFS at sea.
- Helicopters pick up boats from a nearby FOB and drop boats into AO.
- GFS picks up Special Forces and equipment pier-side and proceeds to AO.[139]

1.2.5 **Ocean/Hydro/River Survey & Support Operations**: The ability to conduct and/or support surface and subsurface operations that collect, or enable the collection of, unique environmental conditions in support of real time and future operations. This capability will be inherently linked with NOAA, MCM, and Intel gathering assets.[140]

Overall Weight: 1

This mission area may have significant benefits for coalition, interagency, amphibious, and riverine operations in or near the littorals. The overall weight would be considerably higher if the scenario suggested prolonged operations in a specific region. For our scenario, this attribute was not necessary to complete the assigned GFS mission.

Value Scoring Criteria: The grading for this attribute was based on the

139. Matthew Hawkins, email message to the authors, November 1, 2007.

140. U.S. Joint Requirements Oversight Council, *Joint Capability Areas Tier 1 & 2 Lexicon* (Washington, DC: GPO, 2006): 5.

platform's ability to coordinate and conduct pre-landing surveys of planned beaches/landing sites/ports to determine ability to support amphibious operations with organic and embarked forces. We assumed that these functions could be accomplished via small boat operations. Additionally, the ability to embark NOAA personnel and associated gear for regional oceanographic studies was evaluated.

Value Scores:

CG:	100% - fully capable.
LPD-17:	100% - fully capable.
HSV:	100% - fully capable.
AS:	100% - fully capable.
LHD/FFG:	100% - fully capable.
HSV/RORO:	100% - fully capable.

1.2.6 Fisheries Protection: GFS shall employ experts in the field of fisheries enforcement, along with associated equipment needs, to train Gulf of Guinea navies, coast guards, and civil authorities in protecting their fish stocks.

Overall Weight: 1

Our scenario – with its emphasis on counter-piracy and EMIO - resulted in this low weight to an otherwise important maritime issue in the Gulf of Guinea. Fisheries protection is not a core competency of the USN. Realizing that this important capability may be attained through cooperation with Gulf of Guinea nations and Department of Defense partners, the GFS platform would require dedicated fisheries officers onboard to aid in fisheries regime enforcement, regulation, and protection.

1.2.6.1 Fishing Regimes: GFS shall employ experts in the field of articulating enforceable laws with regard to illegal fishing.

Weight within Attribute: 100%

Value Scoring Criteria: Platforms were scored on the ability to conduct or support patrolling and interception of vessels for possible boarding, inspection and search or seizure in order to enforce applicable foreign fisheries laws from the GFS platform. This ability is inherently linked with the ability to leverage USCG and NOAA capabilities and expertise.

Value Scores:

CG:	100% - fully capable.
LPD-17:	100% - fully capable.
HSV:	100% - fully capable.
AS:	100% - fully capable.
LHD/FFG:	100% - fully capable.
HSV/RORO:	100% - fully capable.

1.3.X Counter Piracy encompasses operations and campaigns to halt transnational crime, and is characterized by directed engagement of non-compliant or hostile vessels. Maritime piracy, according to the United Nations Convention on the Law of the Sea (UNCLOS) of 1982, consists of any criminal acts of violence, detention, or depredation committed for private ends by the crew or the passengers of a private ship (or aircraft) that are directed on the high seas against another ship, aircraft, or against persons or property on board a ship (or aircraft). Piracy can also be committed against a ship, aircraft, persons, or property in a place outside the jurisdiction of any State.

The mission area of Counter Piracy is indirectly linked to the mission areas of HA/DR and Interagency/NGO Coordination, because actions that fall under those areas of responsibility inherently aid in deterring criminal activity in host nations at a fundamental level. From a military-to-military perspective, the capabilities and attributes required to support Counter Piracy overlap with those of EMIO, MSOC, and Foreign Navy Capability Building, hence the absence of attributes with the *1.3*

prefix. For further delineation, one should refer to the Functional Area Analysis section.

1.4.1 **Training Ability**: The ability to conduct training in any of the Peacetime Engagement mission areas and capabilities by embarked training teams or the same personnel assigned to those mission areas.

Overall Weight: 6

In the Gulf of Guinea, our country team identified the needs of Cameroon, Equatorial Guinea, and Nigeria (among others) for Coast Guard, Navy, and/or maritime police training for the purposes of maritime security, countering illegal trafficking and piracy, and border dispute resolution.

Value Scoring Criteria: The grading criteria for a GFS platform was based on its ability to embark, transport, berth, and sustain various training teams. These training teams can either be Department of Defense, USCG, NOAA, or various NGO teams.

Value Scores:

CG:	100% - fully capable.
LPD-17:	100% - fully capable.
HSV:	100% - fully capable.
AS:	100% - fully capable.
LHD/FFG:	100% - fully capable.
HSV/RORO:	100% - fully capable.

1.4.2 **Training Capacity:** GFS shall provide the materials and have (or have the ability to establish) the physical space needed to conduct training in any of the Peacetime Engagement mission areas and capabilities.

Overall Weight: 4

The relatively high weighting of this attribute is inherently linked with the ability of the GFS to conduct mil-to-mil training of foreign navies and coast guards. A platform’s capacity to conduct training enhances the

overall training ability of the GFS. Increased training capacity leads to more productive and valuable training.

Value Scoring Criteria: The criterion for a GFS platform to conduct training is based on its physical capacity to conduct training. This includes the platform's classroom space and capacity to carry additional training aids and materiel.

Value Scores:

CG:	80% - with only the crew's mess, wardroom, and the Library Resource Center (LRC) for training space, all of which are limited in size and/or dedication to other commitments such as meals, and mandatory briefs.
LPD-17:	100% - fully capable.
HSV:	100% - fully capable.
AS:	100% - fully capable.
LHD/FFG:	100% - fully capable.
HSV/RORO:	100% - fully capable.

c. Platform Performance Calculations

Figure 40 encapsulates the weights and scores of each platform with regards to the attributes of Peacetime Engagement. As can be seen in the final summary role, the more traditional grey-hull combinations outperform the HSV, AS, and HSV/RORO combinations in this theater security scenario.

1.0 PEACETIME ENGAGEMENT		**Platforms**						**Missions**			
Attributes	**Weight**	**CG**	**LPD-17**	**HSV**	**AS**	**LHD/FFG**	**HSV/RORO**	**1.1**	**1.2**	**1.3**	**1.4**
								EMIO	**MSOC**	**CP**	**FNCB**
1.0.1 Command, Control, Coordination (C3)	**Value Score:**	**100.00%**	**100.00%**	**80.00%**	**80.00%**	**100.00%**	**80.00%**	x	x	x	x
Weighted:	**8**	**8.79%**	**8.79%**	**7.03%**	**7.03%**	**8.79%**	**7.03%**				
1.0.2 Regional Maritime Situational Awareness (RMSA)	**Value Score:**	**96.67%**	**76.67%**	**93.33%**	**40.00%**	**91.67%**	**93.33%**	x	x	x	x
Weighted:	**8**	**8.50%**	**6.74%**	**8.21%**	**3.52%**	**8.06%**	**8.21%**				
1.1.1 Small Boat Operations Support	**Value Score:**	**100.00%**	**100.00%**	**100.00%**	**40.00%**	**80.00%**	**100.00%**	x	x	x	x
Weighted:	**7**	**7.69%**	**7.69%**	**7.69%**	**3.08%**	**6.15%**	**7.69%**				
1.1.2 Visit, Board, Search, Seizure (VBSS) Team Support	**Value Score:**	**100.00%**	**100.00%**	**100.00%**	**100.00%**	**100.00%**	**100.00%**	x		x	x
Weighted:	**8**	**8.79%**	**8.79%**	**8.79%**	**8.79%**	**8.79%**	**8.79%**				
1.1.3 Sea, Air, Land (SEAL) Team Support	**Value Score:**	**100.00%**	**100.00%**	**100.00%**	**100.00%**	**100.00%**	**100.00%**	x		x	
Weighted:	**5**	**5.49%**	**5.49%**	**5.49%**	**5.49%**	**5.49%**	**5.49%**				
1.1.4 Equipment Storage	**Value Score:**	**100.00%**	**100.00%**	**100.00%**	**60.00%**	**90.00%**	**75.00%**	x		x	
Weighted:	**4**	**4.40%**	**4.40%**	**4.40%**	**2.64%**	**3.96%**	**3.30%**				
1.1.5 Medical Support and Transport	**Value Score:**	**50.00%**	**100.00%**	**50.00%**	**60.00%**	**100.00%**	**50.00%**	x	x	x	x
Weighted:	**4**	**2.20%**	**4.40%**	**2.20%**	**2.64%**	**4.40%**	**2.20%**				
1.1.6 Detainee Coordination	**Value Score:**	**100.00%**	**100.00%**	**100.00%**	**100.00%**	**100.00%**	**100.00%**	x		x	x
Weighted:	**6**	**6.59%**	**6.59%**	**6.59%**	**6.59%**	**6.59%**	**6.59%**				
1.1.7 Helicopter Operations	**Value Score:**	**100.00%**	**80.00%**	**80.00%**	**0.00%**	**100.00%**	**80.00%**	x	x	x	x
Weighted:	**7**	**7.69%**	**6.15%**	**6.15%**	**0.00%**	**7.69%**	**6.15%**				
1.2.1 Force Protection	**Value Score:**	**100.00%**	**100.00%**	**90.00%**	**80.00%**	**100.00%**	**65.00%**	x	x	x	x
Weighted:	**5**	**5.49%**	**5.49%**	**4.95%**	**4.40%**	**5.49%**	**3.57%**				

1.2.2 Ordnance on Target (Surface Warfare)	**Value Score:**	**100.00%**	**95.00%**	**90.00%**	**80.00%**	**95.00%**	**50.00%**	x	x	x	x
Weighted:	**6**	**6.59%**	**6.26%**	**5.93%**	**5.27%**	**6.26%**	**3.30%**				
1.2.3 Protection of SLOCs	**Value Score:**	**100.00%**	**100.00%**	**100.00%**	**70.00%**	**100.00%**	**70.00%**	x	x	x	x
Weighted:	**3**	**3.30%**	**3.30%**	**3.30%**	**2.31%**	**3.30%**	**2.31%**				
1.2.4 Riverine Operations	**Value Score:**	**100.00%**	**100.00%**	**80.00%**	**80.00%**	**100.00%**	**80.00%**	x	x	x	x
Weighted:	**8**	**8.79%**	**8.79%**	**7.03%**	**7.03%**	**8.79%**	**7.03%**				
1.2.5 Ocean/Hydro/River Survey & Support Operations	**Value Score:**	**100.00%**	**100.00%**	**100.00%**	**100.00%**	**100.00%**	**100.00%**		x		x
Weighted:	**1**	**1.10%**	**1.10%**	**1.10%**	**1.10%**	**1.10%**	**1.10%**				
1.2.6 Fisheries Protection	**Value Score:**	**100.00%**	**100.00%**	**100.00%**	**100.00%**	**100.00%**	**100.00%**		x		x
Weighted:	**1**	**1.10%**	**1.10%**	**1.10%**	**1.10%**	**1.10%**	**1.10%**				
1.4.1 Training Ability	**Value Score:**	**100.00%**	**100.00%**	**100.00%**	**100.00%**	**100.00%**	**100.00%**		x	x	x
Weighted:	**6**	**6.59%**	**6.59%**	**6.59%**	**6.59%**	**6.59%**	**6.59%**				
1.4.2 Training Capacity	**Value Score:**	**80.00%**	**100.00%**	**100.00%**	**100.00%**	**100.00%**	**100.00%**		x	x	x
Weighted:	**4**	**3.52%**	**4.40%**	**4.40%**	**4.40%**	**4.40%**	**4.40%**				
		CG	**LPD-17**	**HSV**	**AS**	**LHD/FFG**	**HSV/RORO**				
Total Weighted Score:	**91**	**96.63%**	**96.08%**	**90.95%**	**71.98%**	**96.96%**	**84.85%**				

Figure 40: P.E. Total Value Calculations and Results

d. Sensitivity Analysis of Key Attributes

It can be seen from each of the following sensitivity charts that by changing the weights of key attributes (those with high weights or a wide range of scores amongst alternatives), the affect on the total score of each alternative is small. For instance, RMSA does not necessarily play a key role in determining the best alternative, as it is only one of many attributes, despite its high weighting in our scenario. Clearly, traditional “grey hull” platforms outperformed their non-traditional counterparts, with the CG, LPD, and LHD/FFG scoring higher due primarily to their modern and expansive sensor systems and helicopter assets. However, there is a *point of indifference* – where the total score for the LPD rises to cross over that of the CG. The most dramatic change occurs in the AS score, but even that is not enough to raise its position from the bottom of our overall ranking in the Peacetime Engagement mission area.

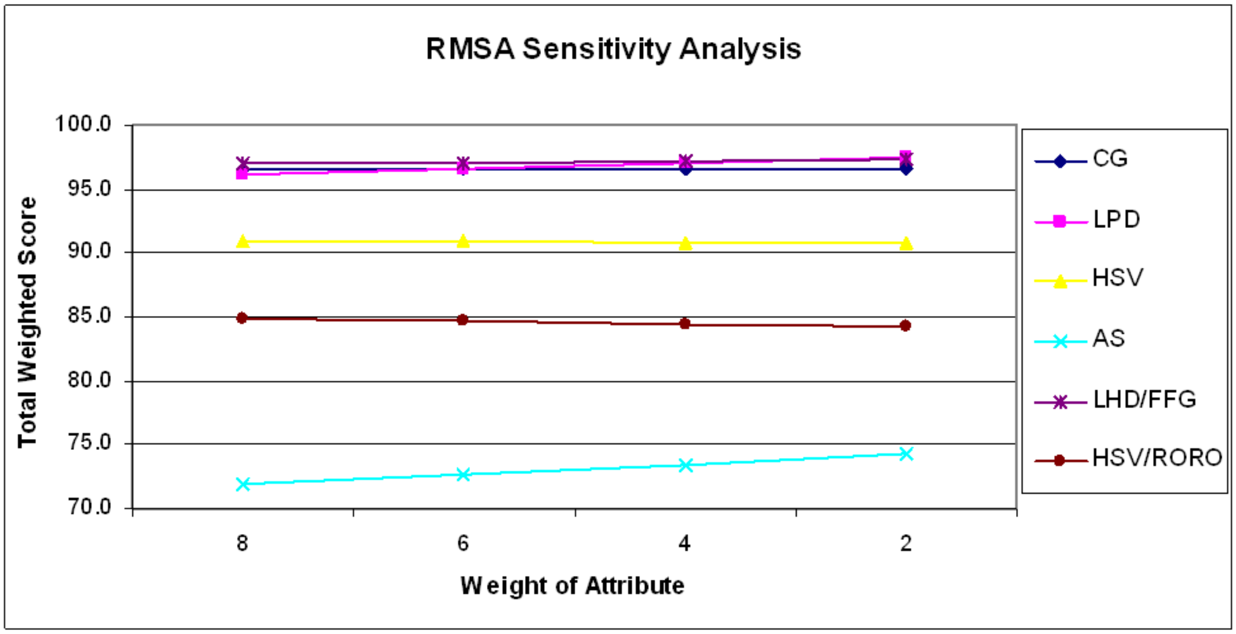

Figure 41: Sensitivity Analysis for RMSA

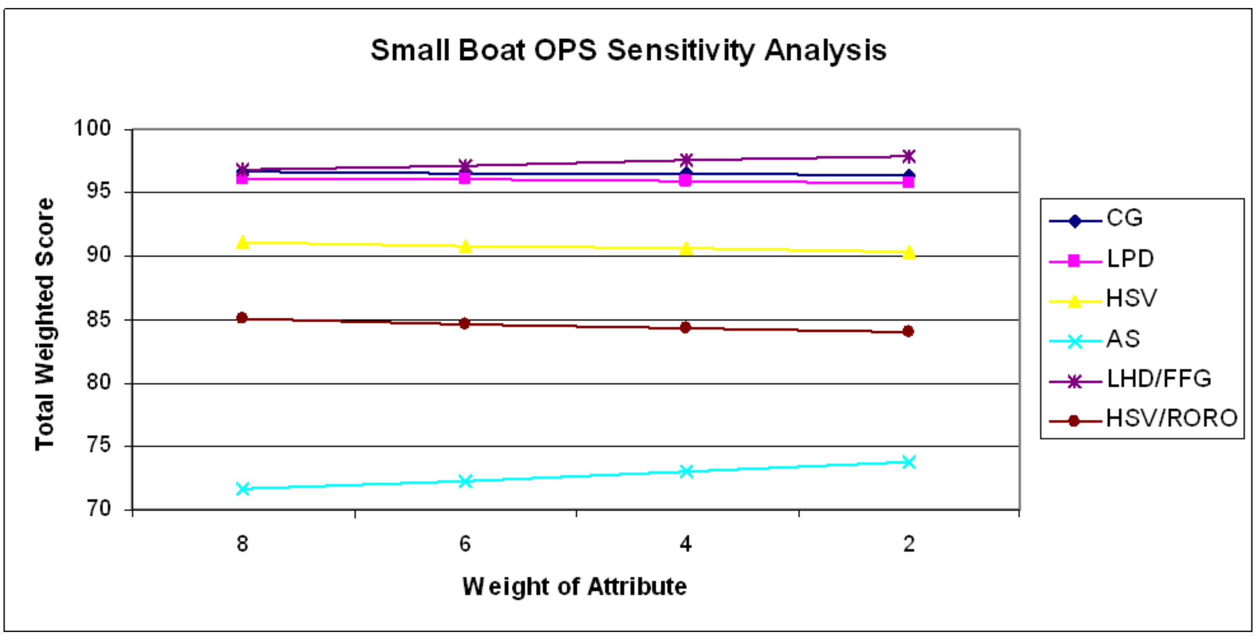

Figure 42: Sensitivity Analysis for Small Boat Operations

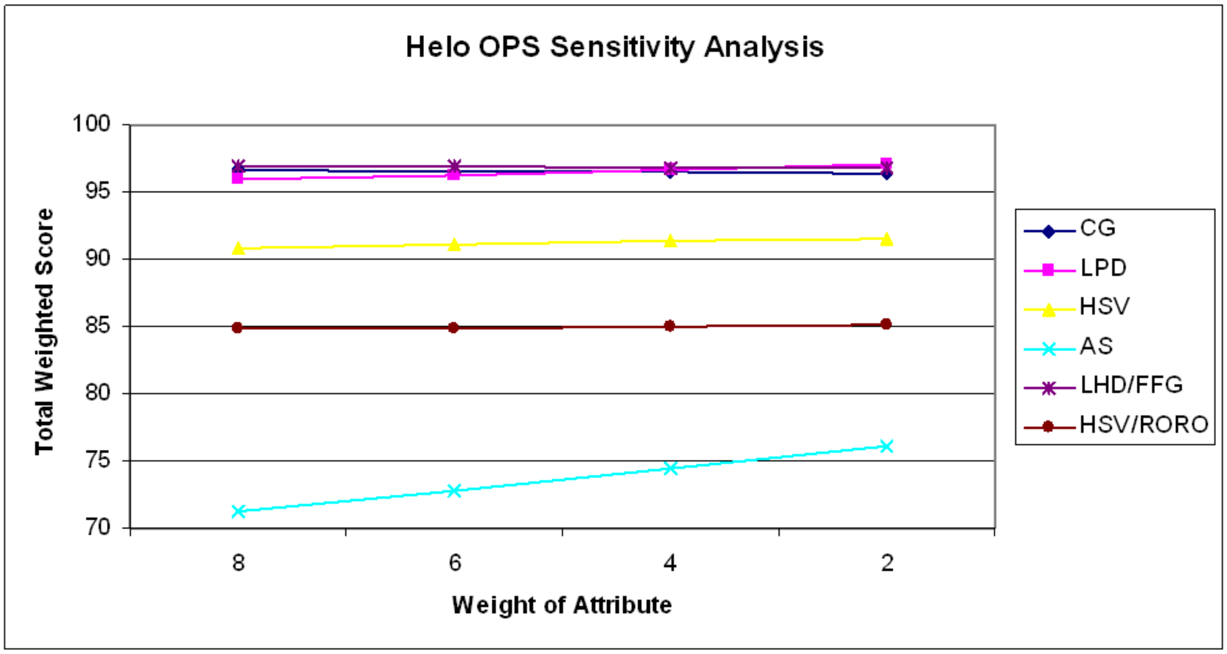

Figure 43: Sensitivity Analysis for Helicopter Operations

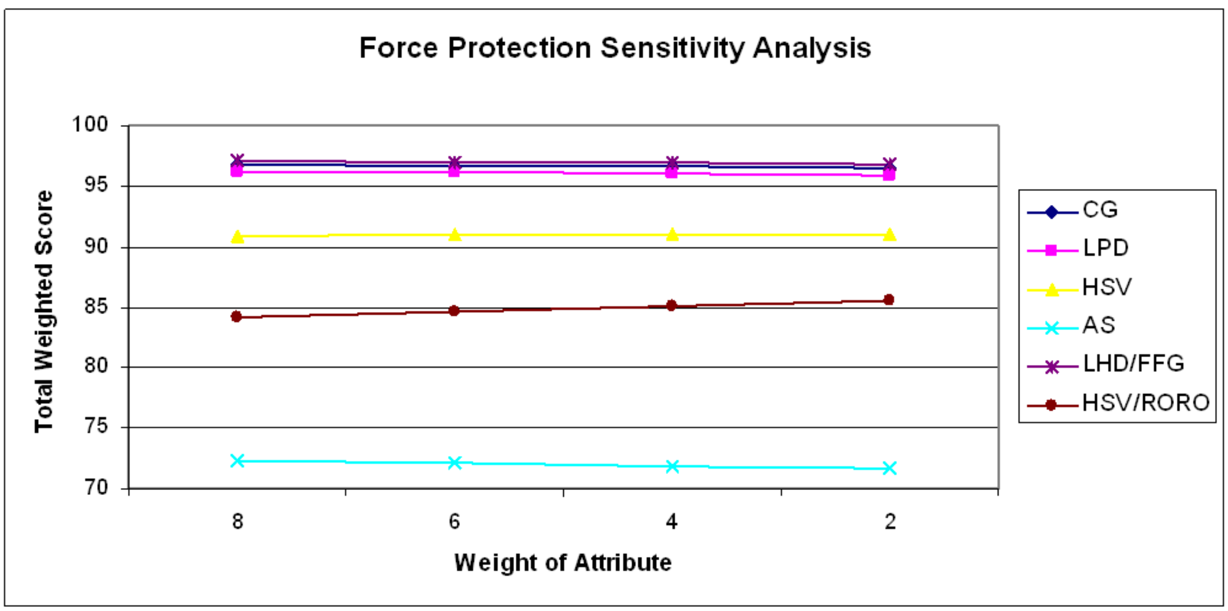

Figure 44: Sensitivity Analysis for Force Protection

Another consideration we needed to address was the uncertainty in our scoring process. The most prevalent sources of error include differences within ship classes, overlap in some attributes (i.e. surge medical capability vs. flexible space for equipment storage), and broad measurement error when some degree of subjectivity was

involved. For these reasons we estimated an uncertainty in our results between 5% and 10%. We ascribe this margin of error to the inherent difficulty in creating non-linear quantitative value functions based on qualitative criteria for attributes that are capability-based.

To further challenge the uncertainty in our analysis, we looked at a completely different scenario – in essence, we conducted a sensitivity analysis on the scenario-based weight of our attributes. One of our key assumptions in the Peacetime Engagement Mission area is that the GFS will be conducting or coordinating EMIO and Riverine Operations. To challenge that assumption we now assumed that the GFS is operating in an environment with increased stability, where Counter Piracy and Riverine Operations are no longer vital or viable missions. In this new scenario, Training, Fisheries Enforcement and Survey & Support Operations are weighted as the most important attributes, with a decreased emphasis on a majority of the key attributes from our previous scenario. The results of this new scenario weighting showed us that while the gap between the best and worst alternatives narrowed slightly, the same system alternatives (CG, LPD-17, and LHD/FFG) maintained their place as our best options (see Figure 45).

1.0 PEACETIME ENGAGEMENT		**Platforms**						**Missions**			
Attributes	**Weight**	**CG**	**LPD-17**	**HSV**	**AS**	**LHD/FFG**	**HSV/RORO**	**1.1**	**1.2**	**1.3**	**1.4**
								EMIO	**MSOC**	**CP**	**FNCB**
1.0.1 Command, Control, Coordination (C3)	**Value Score:**	**100.00%**	**100.00%**	**80.00%**	**80.00%**	**100.00%**	**80.00%**	x	x	x	x
Weighted:	1	**1.56%**	**1.56%**	**1.25%**	**1.25%**	**1.56%**	**1.25%**				
1.0.2 Regional Maritime Situational Awareness (RMSA)	**Value Score:**	**96.67%**	**76.67%**	**93.33%**	**40.00%**	**91.67%**	**93.33%**	x	x	x	x
Weighted:	1	**1.51%**	**1.20%**	**1.46%**	**0.63%**	**1.43%**	**1.46%**				
1.1.1 Small Boat Operations Support	**Value Score:**	**100.00%**	**100.00%**	**100.00%**	**40.00%**	**80.00%**	**100.00%**	x	x	x	x
Weighted:	4	**6.25%**	**6.25%**	**6.25%**	**2.50%**	**5.00%**	**6.25%**				
1.1.2 Visit, Board, Search, Seizure (VBSS) Team Support	**Value Score:**	**100.00%**	**100.00%**	**100.00%**	**100.00%**	**100.00%**	**100.00%**	x		x	x
Weighted:	4	**6.25%**	**6.25%**	**6.25%**	**6.25%**	**6.25%**	**6.25%**				

1.1.3 Sea, Air, Land (SEAL) Team Support	**Value Score:**	**100.00%**	**100.00%**	**100.00%**	**100.00%**	**100.00%**	**100.00%**	x		x	
Weighted:	1	**1.56%**	**1.56%**	**1.56%**	**1.56%**	**1.56%**	**1.56%**				
1.1.4 Equipment Storage	**Value Score:**	**100.00%**	**100.00%**	**100.00%**	**60.00%**	**90.00%**	**75.00%**	x		x	
Weighted:	4	**6.25%**	**6.25%**	**6.25%**	**3.75%**	**5.63%**	**4.69%**				
1.1.5 Medical Support and Transport	**Value Score:**	**50.00%**	**100.00%**	**50.00%**	**60.00%**	**100.00%**	**50.00%**	x	x	x	x
Weighted:	4	**3.13%**	**6.25%**	**3.13%**	**3.75%**	**6.25%**	**3.13%**				
1.1.6 Detainee Coordination	**Value Score:**	**100.00%**	**100.00%**	**100.00%**	**100.00%**	**100.00%**	**100.00%**	x		x	x
Weighted:	1	**1.56%**	**1.56%**	**1.56%**	**1.56%**	**1.56%**	**1.56%**				
1.1.7 Helicopter Operations	**Value Score:**	**100.00%**	**80.00%**	**80.00%**	**0.00%**	**100.00%**	**80.00%**	x	x	x	x
Weighted:	4	**6.25%**	**5.00%**	**5.00%**	**0.00%**	**6.25%**	**5.00%**				
1.2.1 Force Protection	**Value Score:**	**100.00%**	**100.00%**	**90.00%**	**80.00%**	**100.00%**	**65.00%**	x	x	x	x
Weighted:	3	**4.69%**	**4.69%**	**4.22%**	**3.75%**	**4.69%**	**3.05%**				
1.2.2 Ordnance on Target (Surface Warfare)	**Value Score:**	**100.00%**	**95.00%**	**90.00%**	**80.00%**	**95.00%**	**50.00%**	x	x	x	x
Weighted:	1	**1.56%**	**1.48%**	**1.41%**	**1.25%**	**1.48%**	**0.78%**				
1.2.3 Protection of SLOCs	**Value Score:**	**100.00%**	**100.00%**	**100.00%**	**70.00%**	**100.00%**	**70.00%**	x	x	x	x
Weighted:	1	**1.56%**	**1.56%**	**1.56%**	**1.09%**	**1.56%**	**1.09%**				
1.2.4 Riverine Operations	**Value Score:**	**100.00%**	**100.00%**	**80.00%**	**80.00%**	**100.00%**	**80.00%**	x	x	x	x
Weighted:	1	**1.56%**	**1.56%**	**1.25%**	**1.25%**	**1.56%**	**1.25%**				
1.2.5 Ocean/Hydro/River Survey & Support Operations	**Value Score:**	**100.00%**	**100.00%**	**100.00%**	**100.00%**	**100.00%**	**100.00%**		x		x
Weighted:	8	**12.50%**	**12.50%**	**12.50%**	**12.50%**	**12.50%**	**12.50%**				
1.2.6 Fisheries Protection	**Value Score:**	**100.00%**	**100.00%**	**100.00%**	**100.00%**	**100.00%**	**100.00%**		x		x
Weighted:	8	**12.50%**	**12.50%**	**12.50%**	**12.50%**	**12.50%**	**12.50%**				
1.4.1 Training Ability	**Value Score:**	**100.00%**	**100.00%**	**100.00%**	**100.00%**	**100.00%**	**100.00%**		x	x	x
Weighted:	9	**14.06%**	**14.06%**	**14.06%**	**14.06%**	**14.06%**	**14.06%**				
1.4.2 Training Capacity	**Value Score:**	**80.00%**	**100.00%**	**100.00%**	**100.00%**	**100.00%**	**100.00%**		x	x	x
Weighted:	9	**11.25%**	**14.06%**	**14.06%**	**14.06%**	**14.06%**	**14.06%**				
		CG	**LPD-17**	**HSV**	**AS**	**LHD/FFG**	**HSV/RORO**				
Total Weighted Score:	64	**94.01%**	**98.31%**	**94.27%**	**81.72%**	**97.92%**	**90.44%**				

Figure 45: P.E. Total Value Calculations and Results Based on Alternate Data

3. Narrative Summary of Ship Scores and Comments on Results

Incorporating our original scenario-based weighting into each platform's attribute score gave us a total weighted score for each system alternative:

	CG	LPD-17	HSV	AS	LHD/FFG	HSV/RORO
Total Weighted Score	96.63%	96.08%	90.95%	71.98%	96.96%	84.85%

Figure 46: Platform Alternative's Result in P.E.

From these results we can see that the CG, LPD-17, and LHD/FFG combination's scores were extremely similar given the estimated uncertainty in these results. The other system alternatives' scores showed them to perform below these three options, with the AS scoring significantly behind the other system alternatives. This was significant by showing that in the geopolitical context of the Gulf of Guinea there were several system alternatives that were essentially equally capable of conducting the Peacetime Engagement mission. The sensitivity analysis that we conducted – including our alternative scenario – yielded some equally interesting and powerful results. For our mission area the CG, LPD-17, and LHD/FFG combo scored similarly for both scenarios and remained our best options throughout the sensitivity analysis. Given the defined need for GFS and our evaluation of the selected platforms and platform combinations, the CG, LPD-17, and LHD/FFG alternatives are our lead choices for executing the Peacetime Engagement mission of the Global Fleet Station.

D. HUMANITARIAN ASSISTANCE / DISASTER RELIEF FNA

1. Scenario Overview

A list of attributes and measures of effectiveness was developed for GFS HA/DR missions. As subject matter experts in HA/DR based on our studies, we prioritized each attribute by weighting them – or determining their relative importance to the HA/DR mission. Each platform was scored for it's effectiveness in each attribute with respect to this study's HA/DR scenario.

In developing the HA/DR scenario, background research was conducted to identify specific climate and physical characteristics for the Gulf of Guinea region using the EM-DAT database website.[141] For the 13 Gulf of Guinea countries, disaster data from 2002 to 2007 was compiled to better understand the various types of natural disasters that occur in the region. Figure 47 summarizes our findings:

Natural Disaster Type	Occurrences
Coastal Flood/Lake Flood	1
Earthquake	1
Epidemic	66
Flash Floods	0
Flood	33
Insect Infestation	1
Landslide	1
Valley Flood	1
Volcano	1
Wind Storm	4
Wind Storm, Tornado	1

Figure 47: Natural Occurrences in Gulf of Guinea, 2002-2007

As shown, the most common natural disasters for this region include epidemics and floods. The epidemic scenario was not chosen, however, as this example of an act of nature often is characterized as an enduring issue – not something requiring an immediate response. For example, tackling the HIV/AIDS epidemic would be better suited to the deliberate and sustained response offered under our NGO & Interagency mission. We selected a flooding scenario due to the immediate response required with such a disaster, to evaluate the GFS with a demanding mission set, and because of the frequency with which this type of disaster occurs in the region.

a. Scenario Context

[141] EM-DAT: the International Disaster Database, http://www.em-dat.net.

The following scenario is hypothetical, but based on actual past occurrences in the region; it is presented in the context of "current day" in the year 2012:

- *Situation*: In recent weeks, northern Ghana and Ashanti have experienced unusually vast amounts of rainfall resulting in severe flooding throughout the region.
- *Impact*: The ramifications of this flooding have left 250,000 Ashanti people affected, 250 killed and 45,000 homeless. Many of the homeless have relocated to the coastal region to escape the floods, creating refugee and security concerns in the port cities. Approximately 40 percent of urban and 70 percent of rural potable water resources have been contaminated and an outbreak of cholera and/or malaria is imminent throughout the region.
- *Request*: Ghana's President and Ashanti's Regional Minister have requested emergency assistance from the United States.
- *Response*: Global Fleet Station is conducting operations in the vicinity of the Gulf of Guinea and has been tasked by AFRICOM to provide relief in response to this disaster.

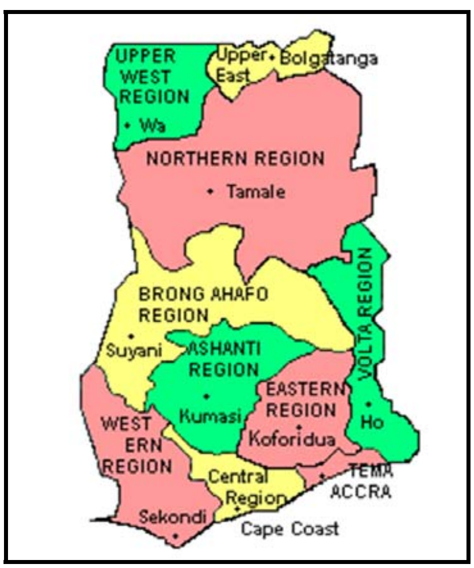

Figure 48: Map of Ghana

b. Scenario Considerations and Assumptions

To generate mission requirements to compare GFS alternatives, we roll-played an AFRICOM staff, and considered the following factors – based on a Navy tactical memorandum - before deciding how to employ GFS for this particular HA/DR scenario[142]:

- Geography/topography of the region
- Current meteorological conditions in the region
- Oceanography/hydrographic nature of the region
- Cultures affected in the region
- Status of existing communication capabilities in the region
- Available host nation support and potential restrictions (physical, political, etc)

The geography of Northern Ghana and Ashanti is primarily a flat plain region. The region's populated areas can be reached by one main road from Accra to Kumasi, but airlifts are normally required to transport large quantities of supplies into the area. The current meteorological conditions were assumed to be stable and all rains that caused the flooding have subsided. GFS will base its operation in the vicinity of the port city of Tema. Vessels can moor pier-side in Tema; however, AFRICOM has ordered the ship to remain at anchorage within the harbor until sufficient security is provided for the ship go pier-side (AFRICOM is concerned that the host nation may not have enough personnel to prevent the disaster victims from rioting or rushing the ship for supplies and other goods). All cultural information available regarding the Ghana and Ashanti societies was disseminated to embarked GFS personnel by FAOs and NGOs already established locally. The region's communications infrastructure is assumed to be disabled, and requires extensive assistance. AFRICOM has coordinated with the State Department to acquire access to all air space, and gained permission and assurances for uninhibited ground transportation.

142. U.S. Department of the Navy, *U.S. Naval Warfare Development Command TACMEMO 3-07.6-05 Humanitarian Assistance/Disaster Relief Operations Planning* (Washington, DC: GPO, 2005).

The staff determined that GFS will provide initial command and control (C2) of the operations, and will be prepared to maintain that role for an indefinite period of time. It will also coordinate the transport of supplies and equipment between different shore locations. GFS must be ready to incorporate and utilize available international assets that are either currently located in, or enroute to, the effected area. Assuming that GFS will be the first U.S. military asset on scene, it will have to sustain C2 and logistical operations for 30 days. This expectation is based on an assumption that other maritime assets will be deployed to support any relief beyond that period.

2. Weighting and Scoring of HA/DR Attributes

a. Overview of Approach

The attributes were generated from the four mid-level functions comprising the HA/DR mission area: Infrastructure, Medical Assistance, Logistics, and Communications. For the HA/DR mission, we determined the significance of our attributes based on the overall importance of HA/DR functions, regardless of scenario. However, the scoring of each alternative platform was based on consideration of the scenario. Some attributes contained several sub-attributes, each of whose scores factored into a score for each platform in each attribute. These calculations then resulted in a total value performance score for each alternative for each function, and ultimately for the HA/DR mission as a whole.

b. Attribute Outcomes

The weighting and scoring results of our HA/DR functions and attributes follow.

2.1 Infrastructure - Joint Publication, 1-02, Department of Defense Dictionary of Military and Associated Terms defines infrastructure as “all building and permanent installations necessary for the support, redeployment, and military forces operations (e.g., barracks, headquarters, airfields, communications,

facilities, stores, port installations, and maintenance stations.)"[143] There are two main attributes of infrastructure, resource and physical networking, which will provide Global Fleet Station the ability to maintain a sustainable presence in regions requiring humanitarian assistance. Figure 49 depicts platform characteristics important to examining Infrastructure attributes.

PLATFORM CHARACTERISTICS	CG	LPD	HSV	AS	LHD	FFG	LHD / FFG	RORO	HSV / RORO
Personnel									
Crew	382	360	42	1400	1123	200	1323	23	65
Space for Additional	23	754	250	N/A	1871	0	1871	100	350
C2 for Commander	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Provide Personnel Ashore from Crew	No	Yes	No	No	Yes	No	Yes	No	No
Cargo Capacities									
Vehicles (sq ft)	N/A	24000	22000	N/A	20000	N/A	20000	168547	190547
Cargo (cu ft)	N/A	34000		N/A	125000	N/A	125000	735 TEU	
Transportation Assets									
SH-60B Seahawk	2	N/A	1	N/A	N/A	2	2	N/A	1
LCAC	N/A	2	N/A	N/A	3	N/A	3	N/A	N/A
CH-46 Sea Knights	N/A	2	N/A	N/A	12	N/A	12	N/A	N/A
CH-53 E Super Stallion	N/A	N/A	N/A	N/A	9	N/A	9	N/A	N/A

Figure 49: Summary of Platform Characteristics for Analysis of Infrastructure

2.1.1 Resource Network - Resource networks are personnel, organizations, materiel, and equipment essential in the deployment and distribution of the physical network.[144]

Overall Weight: 8

The establishment of civil affairs and NGO coordination are critical to HA/DR; hence without either it is difficult to move forward with construction and restoration operations. A functional civil-military relationship provides the

[143] U.S. Office of the Chairman of Joint Chiefs of Staff, *Department of Defense Dictionary of Military and Associated Terms, Joint Publication (JP) 1-02* (Washington, DC: GPO, 2007): 260.

[144] U.S. Office of the Chairman of Joint Chiefs of Staff, *Deployment and Redeployment Operations, Joint Publication (JP) 3-35* (Washington, DC: GPO, 2007): III-8, III-9.

information requests, support and sustainment required to accomplish a pre-determined common goals, set forth prior to the initiation of physical networking.

Scoring Criteria: There are two main attributes in employing a successful resource network: 1) the ability to provide command and control, and 2) and the ability to provide the personnel necessary for HA/DR operations. The following are the sub-attribute considerations for scoring this attribute:

2.1.1.1 Command and Control

2.1.1.1.1 **Provide support staff:** GFS shall have the capability and capacity to advise the commander on all matters.

2.1.1.1.2 **Provide interagency coordination:** GFS shall have the capability and capacity to coordinate all civil affairs with the appropriate US agencies.

2.1.1.1.3 **Coordinate with NGOs:** GFS shall have the capability and capacity to coordinate civil affairs with appropriate NGOs.

2.1.1.2 Personnel

2.1.1.2.1 **Provide personnel and personnel support:** GFS shall have the capability and capacity to provide support to units and individual service members, as well as providing units with trained, healthy, fit personnel.

2.1.1.2.1 **Distribute personnel and support:** GFS shall have the capability and capacity to provide support and replacements to military units.

Each of the sub-attributes is considered to be equally important.

CG: score of 80%. The full complement capacity of a cruiser is 24 officers and 358 enlisted crew, with space available for an additional 23 personnel.[145] There is not enough available space to embark the non-governmental organizational representatives or additional military personnel to coordinate and support the full capacity of the operation; however, the officers and crew can provide advice to the commander and limited civil affairs support to the NGOs. The personnel limitations prevent the support and replacement of personnel ashore participating in relief efforts. The score of 80% reflects the CG's capability to support C2 operations due to the superb C2 architecture that is designed for area air defense coordination and considered the best out of all the platform alternatives; however, due to its inability to provide spaces for additional personnel it did not score as well as either the LPD or LHD.

LPD: score of 85%. This platform has a crew of 360 with 34 additional spaces, and embarkation space of 720. LPD-17 is capable of advising the commander and supporting civil affairs and coordinating with NGOs through the availability of ship's company and those embarked, as well as supporting and replacing personnel ashore. There are no flag-level staff facilities onboard which are not essential to mission accomplishment, but would provide a workspace for NGO personnel to utilize. The score of 85% is slightly higher than the CG's score due to LPD-17s ability to embark additional personnel for HA/DR operations. Its C2 capability is not as robust as the CG's, but is sufficient to conduct HA/DR operations.

HSV: score of 90%. This platform has a crew complement of 42 and is capable of transporting 250 additional personnel to support interagency coordination, civil affairs and personnel distribution and replacement. HSV is also able to advise the commander on all matters utilizing the communications and combat systems

145 Jane's Fighting Ships, "Ticonderoga class: guided missile cruisers (CGHM)," http://www4.janes.com/subscribe/jfs/doc_view.jsp?K2DocKey=/content1/janesdata/yb/jfs/jfs_3530.htm@current&Prod_Name=JFS&QueryText=%3CAND%3E%28%3COR%3E%28%28%5B80%5D%28+cghm+or+%27United+States%27%29+%3CIN%3E+body%29%2C+%28%5B100%5D+%28%5B100%5D%28+cghm+or+%27United+States%27%29+%3CIN%3E+title%29+%3CAND%3E+%28%5B100%5D%28+cghm+or+%27United+States%27%29+%3CIN%3E+body%29%29%29%29.

suites. The only drawback to utilizing this platform is that the crew cannot supplement personnel ashore; however this is overcome by the number of personnel that can embark - hence a score of 90%. Overall, the HSV is able to accomplish a majority of the attribute measures for resource networks.

AS: score of 75%. A submarine tender has a crew of more than 1,400 and is comprised of specialized technicians and repair personnel to support the primary mission. This platform can provide support staff to the commander, but due to communications and intelligence gathering limitations is not recommended to use this platform as a base of operations. The AS crew is highly specialized, making it difficult to provide support and replacement of personnel ashore or provide optimal support in regions that do not have modern hotel services, i.e. electricity, water, telephones, etc. Even with the personnel complement, it does not have a strong enough C2 capability to support HA/DR operations, therefore it was only given a score of 75%.

LHD/FFG: score of 90%. The LHD's large crew also makes it a viable option to supplement and sustain the ashore presence at the relief location. A FFG has a crew of 200 and no available space for additional personnel, thus, this platform provides little support to civil affairs and NGO coordination. When deploying a FFG with a LHD the C2 capability improves by a minimal amount, and the FFG does not provide any extra available spaces for additional personnel therefore a score of 90% was given.

HSV/RORO: score of 90%. The RORO requires a crew of 23 non-military personnel, and the additional 100 embarked personnel the ability to provide support of civil affairs and coordination with NGOs. However; this platform is only able to provide minimal advice to the commander and will rely heavily on HSV for these matters. Combining the RORO with the HSV does not add enough C2 improvement to improve the score of the HSV.

Attribute Summary: The HSV, LHD/FFG, and HSV/ RORO were the best platforms for the resource network attributes. The HSV's ability to embark additional personnel makes it a strong alternative. Both of the combination

platforms have unique characteristics that fully meet the requirements of resource networks.

2.1.2 Physical Network - The type, number and condition of facilities, transportation networks, real estate, and modes of transportation available in the region of activity characterize physical networks. The transportation network is the most vital in the physical infrastructure of a country requiring humanitarian assistance. If there are modernized and/or undamaged facilities available, insertion of military assistance, government and non-government agencies, and logistics support will be conducted more expediently and efficiently. The combatant command will establish an engineering support plan (ESP) to identify facilities, materiel and civil engineering capabilities in support of military forces.[146]

Overall Weight: 7

Physical networking is very important; however, without resource networking, it is difficult to establish and maintain. Civil engineering and transportation support and establishment are the core of the infrastructure function; however, without a functional resource network this attribute is difficult to establish.

Scoring Criteria: There are two main attributes in employing a successful physical network. They are the platform's ability to provide elements to construct *facilities*, and the capability to *transport* necessary materials or equipment for HA/DR operations. The following are the sub-attribute considerations when scoring the attributes:

2.1.2.1 Facilities

2.1.2.1.1 **Perform civil-military engineering support:** GFS shall have the capability and capacity to repair and construct facilities and lines of communications,

146. U.S. Office of the Chairman of Joint Chiefs of Staff, *Deployment and Redeployment Operations, Joint Publication (JP) 3-35* (Washington, DC: GPO, 2007): III-7, III-9.

and provide water, utilities, and other related infrastructure.

2.1.2.1.2 **Perform construction engineering services:** GFS shall have the capability and capacity to construct or renovate temporary and/or permanent facilities.

2.1.2.1.3 **Provide or obtain construction material:** GFS shall have the capability and capacity to acquire or obtain material needed to construct or repair facilities or lines of communication.

2.1.2.1.4 **Perform area restoration:** GFS shall have the capability and capacity to repair area facilities damaged by natural disaster or other causes.

2.1.2.2 Transportation

2.1.2.2.1 **Perform LOC sustainment:** GFS shall have the capability and capacity to maintain land, water and air routes that connect an operating military force with one or more bases of operations and along which supplies and reinforcements move.

2.1.2.2.2 **Provide humanitarian support:** GFS shall have the capability and capacity to provide engineering and construction support and repair for humanitarian assistance to include repair of local facilities and distribution of relief supplies.

CG: score of 40%. Ticonderoga Class Cruisers are not able to provide the civil-military engineering support to successfully conduct HA/DR operations. This platform's inability to transport construction equipment and supplies due to available space limitations, in addition to trained personnel, prevents the establishment of physical networking in support of the infrastructure function. The score of 40% represents that the CG has some ability to transport materials once on-scene through the use of its helicopter assets, but has a deficiency in

delivering the materials and personnel to the region in order to establish necessary facilities in support of HA/DR operations.

LPD: score of 85%. San Antonio Class LPDs have the ability to transport 2 LCACs, and to accommodate 2 CH-46E Sea Knights, in addition to a 24,000 square foot vehicle space and 34,000 cubic foot of cargo space.[147] These capabilities, along with personnel embarkation, allow this platform to support the civil-military engineering measures required by the physical networking attribute. A score 85% was awarded based on the platform's available transportation assets and its cargo storage capacity.

HSV: score of 90%. HSV has a 4,000 square foot flight deck and hangar capable of accommodating a SH-60B Seahawk helicopter which provides a means to transport cargo and personnel to relief sites. In addition to the vertical cargo/personnel transfer capabilities, HSV has the ability to launch/recover small craft or unmanned vehicles up to 13-tons underway, and transfer as much as 11-tons of cargo from the flight deck to adjacent ships or pier-side utilizing the shipboard crane.[148] These options allow for better on-load/off-load management of equipment, supplies and personnel essential to the rapid establishment of the physical network. HSV has a cargo capacity of 680 tons (comparable to 17 C-17 aircraft) and a draft of approximately 12 feet (comparable to a Cyclone-class patrol craft).[149] This platform meets the requirements to store, transport, provide and sustain construction equipment, personnel, and supplies to establish facilities, as well as routes and modes of transportation. A score of 90% was given because the platforms transportation assets do not allow for maximum flow of equipment

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147. Jane's Fighting Ships, "San Antonio class: Amphibious Transport Docks (LPDM)," http://www4.janes.com/subscribe/jfs/doc_view.jsp?K2DocKey=/content1/janesdata/yb/jfs/jfs_3566.htm@current&Prod_Name=JFS&QueryText=%3CAND%3E%28%3COR%3E%28%28%5B80%5D%28+lpdm+or+%27United+States%27%29+%3CIN%3E+body%29%2C+%28%5B100%5D+%28%5B100%5D%28+lpdm+or+%27United+States%27%29+%3CIN%3E+title%29+%3CAND%3E+%28%5B100%5D%28+lpdm+or+%27United+States%27%29+%3CIN%3E+body%29%29%29%29.

148. Harold Kennedy' "Navy's High Speed Vessel Aids Relief Effort," *NationalDefenseMagazine*, http://www.nationaldefensemagazine.org/issues/2005/Nov/Navys_High.htm.

149. Bobby Northnagle, "Swift Delivery Showcases Versatility,"*Navy.mil,* http://www.navy.mil/search/display.asp?story_id=24698.

and supplies from the sea (scenario has the GFS initially anchored). Once pier side this score would improve to 100%.

AS: score of 60%. Submarine tenders are able to provide civil-military engineering support to the HA/DR operation through the use of diversified facilities and cargo capacity. A helicopter platform is available; however it is not possible to embark aviation assets onboard, making it difficult to transport equipment and supplies without being pier-side or having a helicopter available ashore or on another vessel. Even with the amount of storage space available, the lack of transportation assets affected the overall scoring of the AS.

LHD/FFG: score of 95%. A LHD has the capability to transport 3 LCACs and multiple combinations of fixed-wing and rotary-wing aircraft. The aviation detachment for this thesis is 12 CH-46E Sea Knights and 9 CH-53E Super Stallion. The Super Stallion has a personnel capacity of 55 and external cargo capacity of 36,000 pounds.[150] In addition to the air assets onboard the LHD, an FFG is able to embark two SH-60B Seahawk helicopters. A frigate does not provide adequate cargo space; however the LHD has 125,000 cubic foot cargo capability and an additional 20,000 square foot for vehicle storage. The civil-engineering materials and equipment requirements can be stored and transported onboard, as well as additional HA/DR cargo. This combination makes it possible to accomplish all the measures set forth by the physical networking attribute. The LHD and FFG platforms are able to establish and sustain facilities, as well as provide and maintain routes and modes of transportation utilizing the embarked assets.

HSV/RORO: score of 95%. As stated before, the HSV is capable of fulfilling the physical network attribute. For example, the 1ST LT HARRY L MARTIN, is capable of providing 168,547 square feet of cargo space in addition to the HSV.

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150. Jane's All the World's Aircraft, "Sikorsky Aircraft: Sikorsky S-80/H-53E," http://www4.janes.com/subscribe/jawa/doc_view.jsp?K2DocKey=/content1/janesdata/yb/jawa/jawa1456.htm@current&Prod_Name=JAWA&QueryText=%3CAND%3E%28%3COR%3E%28%28%5B80%5Dh-53e+%3CIN%3E+body%29%2C+%28%5B100%5D+%28%5B100%5Dh-53e+%3CIN%3E+title%29+%3CAND%3E+%28%5B100%5Dh-53e+%3CIN%3E+body%29%29%29%29.

Although this platform is unable to embark aircraft, there is a helicopter platform available for vertical cargo/personnel transport. As with the HSV, the RORO is able to provide civil-military engineering support to conduct HA/DR operations.[151] This combination received a score of 95% because the extra capacity that the RORO brings however, the RORO does not have the necessary transportation assets. Again the scenario starts at sea, but once the platforms can go pier-side this number will increase to 100%.

Attribute Summary: The LHD/FFG and HSV/ RORO were the best platforms for the physical network attributes. Both of the combination platforms have enough cargo space to support the attributes of physical networks.

2.2 Medical Assistance - To fully understand and compare the GFS alternatives' medical capabilities it is important to first understand the echelons (or levels) of medical care that military assets are classified by. Today's military medical system incorporates five echelons (Figure 50) of care that begin with the wounding, injury or illness and extend through the eventual evacuation and treatment in the continental United States (CONUS) [152]. Each succeeding echelon builds upon the abilities of preceding levels by adding a new increment of treatment capability. Within a theater of operations, the first four echelons of medical support are characterized not only by increasing levels of medical sophistication but also by distance and access to evacuation assets.

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151. GlobalSecurity.org, "TAK 3015 1st Lt Harry L. Martin, Maritime Pre-positioning Force (Enhanced) MPF(E)," http://www.globalsecurity.org/military/systems/ship/tak-3015-specs.htm.

152. Lois M. Davis, Susan D. Hosek, Michael G. Tate, Mark Perry, Gerard Hepler, Paul Steinberg, "Army Medical Support for Peace Operations and Humanitarian Assistance," *RAND Monograph/Reports* (1996): 183.

Echelons of Medical Care

Echelon I: Immediate lifesaving measures, disease and non-battle injury prevention, combat stress control preventive measures, casualty collection, evacuation from supported units to supporting medical treatment, treatment provided by designated individuals or treatment squad.

Echelon II: Care is administered by a team of physicians or physician assistants, supported by appropriate medical technical or nursing staff.

Echelon III: Care administered requires clinical capabilities normally found in a medical treatment facility.

Echelon IV: Care is not only a surgical capability as provided in Echelon III, but also further definitive therapy for patients in the recovery phase.

Echelon V: Care is convalescent, restorative, and rehabilitative and is normally provided by military, Department of Veterans Affairs, or civilian hospitals in CONUS.

Figure 50: Echelons of Military Medical Care

First echelon care is the first medical care a soldier receives and begins at the non-medical unit level, incorporating self-aid, buddy-aid, on-site medic or corpsman assistance. Care focuses upon casualty examination, lifesaving measures (airway, bleeding, shock), and preparation for further evacuation. Treatment examples include surgical airway restoration, intravenous (IV) administration of-fluids, use of antibiotics, and application of bandages and splints. A typical first echelon medical facility would be a Marine Corps battalion aid station or a Navy surface combatant (i.e. Frigate, Destroyer, or Cruiser).

Second echelon care is division-level health service support and is provided at a medical facility by a team of physicians and supporting technical staff. It always includes the ability to perform resuscitation and stabilization and may include surgery, basic laboratory, pharmacy, radiology, and dental capabilities as well. Often, second echelon units are able to hold patients for up to 72 hours and may be able to administer blood transfusions. Care focuses upon emergency procedures to prevent probable death or loss of limb or body

functions; however, treatment does not exceed measures dictated by immediate need. Typical second echelon facilities are Marine Corps medical companies and/or large deck Navy surface combatants (i.e. Aircraft Carrier or Amphibious Assault Ship).

Third echelon care facilities are the first places capable of providing in-patient medical care. Third echelon care is corps-level health service support and includes the ability to hold patients for extended periods of time. These facilities provide the first step toward restoration of functional health and always include the ability to perform preoperative diagnostic procedures, intensive surgical preparation, general anesthesia, and postoperative care. Typical third echelon facilities are the deployable medical system hospitals used by all services and Navy's hospital ships (i.e. USNS COMFORT and USNS MERCY).

Fourth echelon care is usually provided at a fixed medical treatment facility located outside the operating area, but probably within the theater of operations. Here, patients receive further treatment to stabilize them for their evacuation to CONUS. Fourth echelon hospitals are staffed and equipped to provide definitive, rehabilitative care to return casualties to duty. These medical treatment facilities are the final in-theater hospitals.

Fifth echelon care is also provided by fixed medical treatment facilities. Fifth echelon hospitals are located within the continental United States and are staffed and equipped to provide convalescent, restorative, and rehabilitative services in addition to definitive and specialized medical care. This is the most definitive care provided to all categories of patients in CONUS and OCONUS military personnel.

The following is a brief overview of the medical capabilities of the platforms evaluated for this functional needs analysis. These medical characteristics and capabilities provide the foundation for which each platform was graded in the context of the specific HA/DR scenario.

Platform Medical Capabilities

LHD		LPD-17	
Medical Manning		Medical Manning	
Medical Corps	3	Medical Corps	1
Dental Corps	1	Dental Corps	1
Hospital Corpsmen	22	Hospital Corpsmen	14
Medical Facilities		Medical Facilities	
Operating Rooms	6	Operating Rooms	2
ICU Beds	17	ICU Beds	3
Ward Beds	47	Ward Beds	18
Overflowbeds	60	OverflowBeds	100
Ancillary:		Ancillary Capabilities:	
Lab	yes	Lab	yes
X-ray	yes	X-ray	yes
Blood Bank	yes	Blood Bank	yes

Figure 51: LHD and LPD-17 Medical Capabilities

LHDs have the largest medical capability of any amphibious ship currently in use. The medical manning and facilities available (Figure 51) on a LHD enable it to provide an effective, but limited, amount of short-term (less than 30 days) medical assistance in response to HA/DR disaster. A LHD is classified as an echelon II asset.

LPDs have the medical facilities to provide an adequate amount of short-term medical assistance, however, medical manpower limitations would likely cause it to be overwhelmed by the immediate medical requirements in a HA/DR environment (Figure 51). A LPD-17 is classified as an echelon II asset.

Platform Medical Capabilities

	CG		FFG
Medical Manning		Medical Manning	
Medical Corps	0	Medical Corps	0
Dental Corps	0	Dental Corps	0
Hospital Corpsmen	3	Hospital Corpsmen	2
Medical Facilities		Medical Facilities	
Operating Rooms	1	Operating Rooms	1
ICU Beds	1	ICU Beds	1
Ward Beds	1	Ward Beds	1
Overflowbeds	0	Overflowbeds	0
Ancillary:		Ancillary Capabilities:	
Lab	no	Lab	no
X-ray	no	X-ray	no
Blood Bank	no	Blood Bank	no

Figure 52: CG and FFG Medical Capabilities

CGs do not have the medical manning or facilities (Figure 52) to provide medical assistance in a HA/DR disaster. The independent duty corpsman (IDC) and junior hospital corps assigned to this platform could provide some minor medical support to a limited number of evacuees; however, major injuries would require medical evacuation to more robust facilities. A CG is classified as an echelon I asset.

FFGs do not have the medical manning or facilities (Figure 52) to provide medical assistance in a HA/DR disaster. Here again, the independent duty corpsman (IDC) and junior hospital corps assigned to this platform could provide some minor medical support to a limited number of evacuees; however, major injuries would require medical evacuation to more robust facilities. A FFG is classified as an echelon I asset.

Platform Medical Capabilities

AS		HSV	
Medical Manning		**Medical Manning**	
Medical Corps	3	Medical Corps	0
Dental Corps	3	Dental Corps	0
Hospital Corpsmen	27	Hospital Corpsmen	2
Medical Facilities		**Medical Facilities**	
Operating Rooms	1	Operating Rooms	1
ICU Beds	1	ICU Beds	0
Ward Beds	6	Ward Beds	0
Overflowbeds	0	OverflowBeds	0
Ancillary:		Ancillary Capabilities:	
Lab	yes	Lab	no
X-ray	yes	X-ray	no
Blood Bank	yes	Blood Bank	no

Figure 53: AS and HSV Medical Capabilities

The AS has the medical manning and facilities (Figure 53) to provide an effective, but limited, amount of short-term medical assistance in response to HA/DR disaster. An AS is classified as an echelon II asset.

HSVs do not have the medical manning or facilities (Figure 53) to provide medical assistance in a HA/DR disaster. The independent duty corpsman (IDC) and junior hospital corps assigned to this platform could provide some minor medical support to a limited number of evacuees; however, major injuries would require medical evacuation to more robust facilities. A HSV is classified as an echelon I asset.

Platform Medical Capabilities

MPF(E)

Medical Manning	
Medical Corps	0
Dental Corps	0
EMT-Trained	1
Medical Facilities	
Operating Rooms	1
ICU Beds	0
Ward Beds	0
Overflow beds	0
Ancillary:	
Lab	no
X-ray	no
Blood Bank	no

Figure 54: RORO Medical Capabilities

MPF(E) ships do not have the medical manning or facilities (Figure 54) to provide medical assistance in a HA/DR disaster. The chief mate or second mate assigned to this platform is the designated medical representative and typically only has a limited amount of medical training (i.e. Emergency Medical Technician). Given this minimal training, this individual would only be capable of providing minor medical support to a limited number of evacuees. Major injuries would require medical evacuation to more robust facilities. A MPF(E) is classified as an echelon I asset.

2.2.1 Health Services - Services designed to preserve, promote, improve, conserve, and restore the medical and physical well being of both the responding forces and affected population. This attribute includes providing emergency and routine dental, medical, preventive, and veterinarian care.

Overall Weight: 6

A weighting of 6 indicates that the capability of HA/DR first responders to provide health services effectively to an affected population are very important. The deployment of medical care resources following a disaster remains one of the primary actions taken by responding forces.

Scoring Criteria: Scoring was focused on evaluating the ability of a platform to provide dental, medical, preventive, and veterinarian services to both an affected population and any responding forces. This evaluation was primarily based on existing asset and manpower capabilities designed for each individual platform. The following sub-attributes were considered in the scoring of each platform:

2.2.2.1 Medical Staff Support: GFS shall have the capability and capacity to advise the commander on matters relating to the state of health, sanitation, and medical readiness.

2.2.2.2 Medical Support: GFS shall have the capability and capacity to provide and support large-scale medical care for forces ashore.

2.2.2.3 Medical Liaison: GFS shall have the capability and capacity to coordinate support with outside relief agencies (Red Cross, NGOs, and IGOs) in theater to ensure complete visibility for overall medical situation and requirements, including integrated transfer of responsibilities for policies and procedures.

2.2.2.4 Host Nation Support: GFS shall have the capability and capacity to liaison with host nation governmental authorities and civilian organizations, where and when applicable, to ensure complete support for health service support.

2.2.2.5 Provide for Mass Casualty (MASCAL) and Evacuation Situations: GFS shall have the capability and capacity for handling, to include casualty management.

2.2.2.6 Medical Intelligence

2.2.2.6.1 Obtain and Analyze Medical Information: GFS shall have the capability and capacity to review, catalog, and report information obtained in the course of current

operations to include communicable diseases, epidemiological data, chemical and biological agents, and other useful information.

2.2.2.7 Patient Movement

2.2.2.7.1 Coordinate Patient Movement: GFS shall have the capability and capacity to coordinate the evacuation of the sick and wounded and to obtain consultation and assistance from remote sources.

2.2.2.7.2 Patient Movement Items (PMI): GFS shall have the capability and capacity to provide specific medical equipment and durable supplies to support the patient.

2.2.2.8 Train Medical and Non-medical Personnel: GFS shall have the capability and capacity to provide training in first aid, preventive medicine, and in advanced skills to support medical response to mass causality situations and operation specific threats

2.2.1.1 Dental Services

2.2.1.1.1 Provide Emergency Dental Care: GFS shall have the capability and capacity to provide care for the relief of oral pain; diagnosis and treatment of infections; control of life-threatening oral conditions; and treatment of trauma to teeth, jaws, and associated facial structures,

2.2.1.1.2 Provide Essential Non-Emergency Dental Care: GFS shall have the capability and capacity to provide care necessary to intercept potential emergencies. This care is intended to maintain the overall oral fitness of personnel at a level consistent with combat readiness.

2.2.1.1.3 Provide Comprehensive Care: GFS shall have the capability and capacity to provide dental treatment to restore and/or maintain optimal oral health, function, and esthetics is comprehensive dental care.

2.2.1.2 **Medical Services**

2.2.1.2.1 **Provide Ambulatory Health Care:** GFS shall have the capability and capacity to provide routine, acute and emergent health services to individuals.

2.2.1.2.2 **Provide Laboratory and Pharmaceutical Services:** GFS shall have the capacity to provide diagnostic and clinical laboratory capabilities; manage and procure medical, dental, and veterinary supplies; provide for prescription refill; and provide procedures for the distribution and documentation of any pharmaceuticals.

2.2.1.2.3 **Support of HA/DR Operations:** GFS shall have the capability and capacity to provide health services to local populace in support of humanitarian assistance, to include disaster relief and civil action programs.

2.2.1.2.4 **Provide Surgical and Inpatient Care:** GFS shall have the capability and capacity to provide resuscitative and surgical care and inpatient services.

2.2.1.2.5 **Provide Triage:** GFS shall have the capability and capacity to classify incoming casualties by level of treatment required.

2.2.1.3 **Preventive Medicine and Health Surveillance**

2.2.1.3.1 **Provide Industrial and Environmental Health Services:** GFS shall have the capability and capacity to implement and monitor occupational and environmental hazard abatement measures. This includes hazardous material (HAZMAT) management, storage, and disposal.

2.2.1.3.2 **Conduct Vector Control and Management:** GFS shall have the capability and capacity to advise and coordinate the prevention and/or eradication of vector

born diseases (i.e. viruses or parasites transmitted by mammals, birds, or insects).

2.2.1.3.3 Conduct Waste Control and Management: GFS shall have the capability and capacity to dispose of regulated medical waste (blood and blood products, infectious, pathological, sharps, isolation, and microbiological cultures) and radiological waste.

2.2.1.4 Veterinary Services: GFS shall have the capability and capacity to provide support for animal health care, veterinary preventive medicine, and food safety and security programs.

CG: Score of 30% is based on the small number of medically trained personnel assigned to this platform and the lack of physical resources (rooms and lab facilities) available onboard to support anticipated medical response requirements resulting from a disaster. This platform is capable of meeting the medical requirements of its crew, but significantly limited in its ability to provide any dental and veterinarian support care ashore.

LPD-17: Score of 75%. The personnel and resources available on the LPD can provide effective medical, dental, and preventive medicine and health surveillance support to a HA/DR response. The LPD-17 score is lower than the LHD because it has fewer medical personnel and resources available to support relief requirements.

HSV: Score of 30% is based on the small number of medically trained personnel assigned to this platform and the lack of physical resources (rooms and lab facilities) available onboard to support anticipated medical response requirements resulting from a disaster. This platform is capable of meeting the medical requirements of its crew, but significantly limited in its ability to provide any dental and veterinarian support care ashore.

AS: Score of 80%. The personnel and resources available on the AS can provide effective medical, dental, and preventive medicine and health surveillance support to a HA/DR response. The AS scored lower than the LHD because it has fewer

medical personnel and resources available to support relief requirements, but slightly more than the LPD possesses.

LHD/FFG: Score of 90% is largely based on the medical capabilities of the LHD. The personnel and resources available on the LHD can provide effective medical, dental, and preventive medicine and health surveillance support to a HA/DR response. The lack of manpower and facilities limits the amount of support that the FFG could provide to the overall response effort.

HSV/RORO: Score of 30% is based on the small number of medically trained personnel assigned to this alternative and the lack of physical resources (rooms and lab facilities) available onboard to support anticipated medical response requirements resulting from a disaster. Both of these platforms are capable of meeting the medical requirements of its crew, but significantly limited in its ability to provide any dental and veterinarian support care ashore. Pairing them together provides no extra benefit because of the lack of medical capabilities and resources each platform possess.

Attribute Summary: The amphibious platforms (LHD and LPD-17) are significantly more capable at meeting the HA/DR health services requirements based on their inherent medical capacities. These platforms have the medical expertise, equipment, facilities, and personnel to support the quantity and range of medical care needs associated with these disasters. None of the platforms evaluated, however, has the capability to provide adequate veterinary services to an affected population. This deficiency could be resolved by embarking Army or civilian veterinarians as part of the embarked crew. These individuals would prove valuable in building enduring relationships with regional populations through interaction and the rendering of veterinarian services during port visits.

2.2.2 Plans and Operations - The coordination and cooperation of inter-agency, military, and non-governmental assets required to effectively respond to a HA/DR crisis. Following a natural or man-made disaster, medical requirements will range from emergency/trauma care to preventive medicine, to delivery of

water, food, shelter and security. Thus, the coordination and execution of medical operations among the various respondents is multifaceted in a HA/DR environment. This plans and operations attribute includes medical staff support, level II/III medical support, medical liaison, host nation support, mass casualty (MASCAL) and evacuation, medical intelligence, patient movement, and training personnel.

Overall Weight: 5

The capability of deployed Navy assets to effectively plan and execute a HA/DR relief operation is important. As with most operational planning activities, the amount of coordination and preparation conducted prior to execution will typically correlate to a successful relief operation.

Scoring Criteria: Scoring was focused on evaluating the ability of a platform to effective coordinate medical assistance and relief support amongst all responding forces (i.e. military, NGO, and host nation). This evaluation was primarily based on existing asset and manpower capabilities designed for each individual platform. The following attributes were considered in the scoring of each platform:

2.2.2.1 **Medical Staff Support:** GFS shall have the capability and capacity to advise the commander on matters relating to the state of health, sanitation, and medical readiness.

2.2.2.2 **Medical Support:** GFS shall have the capability and capacity to provide and support large scale medical care for forces ashore.

2.2.2.3 **Medical Liaison:** GFS shall have the capability and capacity to coordinate support with outside relief agencies (Red Cross, NGOs, and IGOs) in theater to ensure complete visibility for overall medical situation and requirements, including integrated transfer of responsibilities for policies and procedures.

2.2.2.4 Host Nation Support: GFS shall have the capability and capacity to liaison with host nation governmental authorities and civilian organizations, where and when applicable, to ensure complete support for health service support.

2.2.2.5 Provide for Mass Casualty (MASCAL) and Evacuation Situations: GFS shall have the capability and capacity for handling, to include casualty management.

2.2.2.6 Medical Intelligence

2.2.2.6.1 Obtain and Analyze Medical Information: GFS shall have the capability and capacity to review, catalog, and report information obtained in the course of current operations to include communicable diseases, epidemiological data, chemical and biological agents, and other useful information.

2.2.2.7 Patient Movement

2.2.2.7.1 Coordinate Patient Movement: GFS shall have the capability and capacity to coordinate the evacuation of the sick and wounded and to obtain consultation and assistance from remote sources.

2.2.2.7.2 Patient Movement Items (PMI): GFS shall have the capability and capacity to provide specific medical equipment and durable supplies to support the patient.

2.2.2.8 Train Medical and Non-medical Personnel: GFS shall have the capability and capacity to provide training in first aid, preventive medicine, and in advanced skills to support medical response to mass causality situations and operation specific threats

CG: A score of 10% is based on the small number of medically trained personnel assigned to this platform and the lack of physical resources (medical facilities)

available onboard to support anticipated medical response requirements resulting from a disaster. As an echelon I platform, a CG does not have the necessary assets to support the medical requirements of higher echelons (II or III). The lack of medical personnel also significantly inhibits its ability to provide host nation support, conduct adequate medical training, or coordinate patient movement.

LPD-17: A score of 80%. As an echelon II platform, the LPD-17 has some of the necessary expertise and facilities to support medical assistance planning efforts, but has fewer personnel, spaces, and organic air assets than a LHD to support MASCAL and evacuation efforts.

HSV: A score of 10% is based on the small number of medically trained personnel assigned to this platform and the lack of physical resources (medical facilities) available onboard to support anticipated medical response requirements resulting from a disaster. As an echelon I platform, a HSV does not have the necessary assets to support the medical requirements of higher echelons (II or III). The lack of medical personnel also significantly inhibits its ability to provide host nation support, conduct adequate medical training, or coordinate patient movement.

AS: A score of 80%. As an echelon II platform, the AS has some of the necessary expertise and facilities to support medical assistance planning efforts, but lacks organic air assets to support MASCAL and evacuation efforts.

LHD/FFG: A score of 90% is largely based on the medical capabilities of the LHD. The personnel and resources available on the LHD can effectively coordinate and plan all medical support requirements prior to a disaster. The LHD has the experienced medical personnel required to effectively liaison with all parties involved in the relief effort. It also has the required medical facilities and evacuation assets to support any potential MASCAL or evacuation requirements. The lack of manpower and facilities limits the amount of support that the FFG could provide to the overall response effort.

HSV/RORO: A score of 10% is based on the small number of medically trained personnel assigned to this alternative, and the lack of physical resources (medical

facilities) available onboard to support anticipated medical response requirements. As echelon I platforms, neither of these have the necessary organic assets to support the medical requirements of higher echelons (II or III). Pairing them together provides no extra benefit because of the lack of medical capabilities and resources each platform possess. The lack of medical personnel also significantly inhibits its ability to provide host nation support, conduct adequate medical training, or coordinate patient movement.

Attribute Summary: The LHD, LPD-17, and AS are significantly more capable at supporting HA/DR planning and operational requirements based on their organic medical expertise, equipment, facilities, and personnel to support the range of disaster medical coordination and planning requirements. It should be noted that none of the platforms evaluated, has the capability to provide echelon III medical support to an affected population. This deficiency can be resolved through the assignment of a hospital ship (USNS MERCY or COMFORT) or allocating the space for field/fleet hospitals (Figure 55) onboard the LHD, LPD-17, HSV, or the MFP(E).

Figure 55: Navy Field Hospital

2.2.3 Medical Logistics – This is the holding, issuing, and accounting for all medical, dental, and veterinary supplies (equipment, pharmaceutical, and consumables). Disaster supplies, in particular, should include bottled water (until a potable water production, storage and distribution system is restored), blankets, lumber and plastic sheeting for shelters and palletizing supplies, food, water bladders or potable water pillow tanks, reverse osmosis water purification units, and empty water containers. Within this attribute are the elements of clinical capabilities and health service logistic support and blood management. This attribute includes clinical capabilities/health service logistical support and blood management.

Overall Weight: 6

The capability of to provide medical logistical support to HA/DR first responders is very important. It does no good for first responders to arrive in a disaster area without the necessary medical supplies, equipment, and skills. These responders must arrive with the capacity to effectively prioritize and distribute essential medical relief assets in a timely manner that reflects the need of the disaster area.

Scoring Criteria: Scoring was focused on evaluating the ability of a platform to effectively coordinate and deliver medical logistical support as required by first responders, based primarily on each individual platform's existing logistical support capability. The following sub-attributes were considered in the scoring:

- **2.2.3.1 Clinical Capabilities and Health Service Logistic Support:** GFS shall have the capability and capacity to provide for specific clinical capabilities, location, health service logistic supportability, and bed requirements.
- **2.2.3.2 Blood Management:** GFS shall have the capability and capacity to coordinate blood requirements and distribution of blood and blood products to support all operational requirements.

CG: A score of 15% is based on the lack of physical resources (medical facilities) available onboard to support these logistical requirements. A CG

simply does not have the blood management capability, personnel, or storage space to meet disaster requirements.

LPD-17: A score of 70% is based on the LPD-17s ability to store, transport, and deliver medical equipment, personnel, and supplies in a disaster area as required. The embarked LCACs provide the LPD-17 with a capability to deliver up to 72 tons of supplies ashore in situations where mooring pier-side are unavailable. The LPD-17 also has the medical facilities to support clinical and blood management requirements.

HSV: A score of 30%. The HSV has the ability to store some medical equipment and supplies. With no embarked air or maritime assets, however, the HSV lacks the ability to transport and deliver large quantities of medical equipment, personnel, and supplies in a disaster area. In addition, the HSV lacks the personnel and facilities to support clinical and blood management requirements.

AS: A score of 65% is based on some ability of the AS to support clinical services, blood management, and store medical equipment and supplies. With no embarked air or maritime assets, however, the AS lacks the ability to transport and deliver large quantities of medical equipment, personnel, and supplies in a disaster area.

LHD/FFG: A score of 85% is based on the LHDs ability to store, transport, and deliver medical equipment, personnel, and supplies in a disaster area as required. And considering that the ship may not be pier-side, the LHD also has embarked LCACs, which provide it with a significant heavy lift capability (up to 72 tons of supplies). The LHD also has the medical facilities to support clinical and blood management requirements. The FFG does not have the blood management capability, personnel, or storage space to meet disaster requirements, and thus does not provide to the overall logistical support effort.

HSV/RORO A score of 50% is based on the ability of these platforms to store medical equipment and supplies. With no embarked air or maritime assets, however, both of these platforms lack the ability to transport and deliver large

quantities of medical equipment, personnel, and supplies in a disaster area. In addition, neither has the personnel or facilities to support clinical and blood management requirements.

Attribute Summary: The LHD and LPD-17 are more capable of supporting logistical requirements based on their organic facilities and embarked craft. Both platforms have sufficient storage capacity and the necessary personnel and air/maritime assets to effectively deliver and distribute medical support equipment, personnel, and supplies to an affected population.

2.2.4 Administrative Services – This attribute involves the maintaining and managing the health and dental records, and other documentation relating to the provision of health care to first responding and an affected population.

Overall Weight: 1

Accurate documentation of medical services provided are important, however, in a disaster environment the materials and/or personnel may not be possible or even available to support this requirement. As a consequence, this task may be relegated to non-medically trained support personnel.

Scoring Criteria: Scoring was focused on evaluating the ability of a platform to effectively manage and maintain medical documents relating to medical assistance renders in a disaster area. This evaluation was primarily based on the availability of personnel onboard each individual platform to support this administrative requirement. Although medically trained personnel may not be available, there are sufficient numbers of professionally trained sailors onboard these platforms to adequately support this requirement. The following sub-attribute was considered:

> **2.2.4.1 Records:** GFS shall have the capability and capacity to maintain health and dental records, and other documentation relating to the provision of health care.

A Score of 100% was assigned for all platforms based on their adequate crew sizes and administrative services.

Attribute Summary: All platforms were equally capable of meeting the requirements of this attribute. It should be noted that the grading will change based on the severity of the disaster. Should the situation change where the number of casualties or injuries increased significantly, there would be a variation in the platform grading.

2.3 Logistics - Logistics is the art and science of managing and controlling the flow of goods, energy, information and other resources like products, services, and people, from the source of production to the marketplace. It involves the integration of information, transportation, inventory, warehousing, material handling, and packaging. The operating responsibility of logistics is the geographical repositioning of raw materials, work in process, and finished inventories where required at the lowest cost possible.[153] There are five attributes for logistics: supply, maintenance, transportation, civil engineering, and other services. Figure 56 highlights platform characteristics important to examining the attributes of the infrastructure function:

PLATFORM CHARACTERISTICS	CG	LPD	HSV	AS	LHD	FFG	LHD / FFG	RORO	HSV / RORO
Cargo Capacities									
Vehicles (sq ft)	N/A	24000	22000	N/A	20000	N/A	20000	168547	190547
Cargo (cu ft)	N/A	34000		N/A	125000	N/A	125000	735 TEU	
Transportation Assets									
SH-60B Seahawk	2	N/A	1	N/A	N/A	2	2	N/A	1
LCAC	N/A	2	N/A	N/A	3	N/A	3	N/A	N/A
CH-46 Sea Knights	N/A	2	N/A	N/A	12	N/A	12	N/A	N/A
CH-53 E Super Stallion	N/A	N/A	N/A	N/A	9	N/A	9	N/A	N/A

Figure 56: Summary of Platform Characteristics for Analysis of Logistics

2.3.1 Supply: Supply is the capability of the platform to acquire, manage, receive, store and issue the materials required by forces.

Overall Weight: 6

153. Wikipedia, "Logistics," http://en.wikipedia.org/wiki/Logistics.

The supply portion of logistics is weighted at 6 because of its importance to the entire logistical chain. If we cannot provide the supplies, the other attributes become null and void. If we do not have the supplies, and equipment to provide shelter, fresh water, food and other essentials to the host nation affected, the HA/DR relief effort becomes futile.

Scoring Criteria: There are five sub-attributes in employing a successful supply capability. In scoring, the main consideration is cargo capacity for each platform. However, each platform inherently has a supply capability, which allows for ships to acquire, manage, receive, store, and issue supplies. This inherent capability is accounted for so none of the platforms will score a 0% because of that. The following are the sub-attributes considerations when scoring the attributes:

2.3.1.1 **Acquisition:** GFS shall have the ability to attain required supplies for HA/DR missions as required.

2.3.1.2 **Management:** GFS shall be able to manage the required resources properly in order to respond to a HA/DR mission as necessary.

2.3.1.3 **Receiving:** GFS will utilize the supply system in place to receive required HA/DR materials prior to deployment. **The s**hip must be able to order and on-load the necessary HA/DR equipment.

2.3.1.4 **Storing:** GFS will provide adequate storage facilities for necessary HA/DR equipment. Storage room for adequate relief supplies will include water, food and nutrition, shelter, communications capability, Search and Rescue (SAR) capability, first aid and medical supplies, clothing, infant requirements, and provide for electricity and fuel requirements.

2.3.1.5 **Issuing:** GFS will provide an adequate system for issuing and tracking all HA/DR materials used**. The** ship must have

the ability to track the dispersion of HA/DR supplies and equipment.

CG: Score of 30% due to the lack of available storage space for equipment and supplies on the CG. Even with the lack of available storage space the CG has supplies that it is deployed with and therefore meet some of the supply attribute.

LPD: Score of 90% because the LPD has adequate storage space for the required supplies and equipment but it does not have as much as the HSV/RORO.

HSV: Score of 85% because it has more than adequate storage capability for the required supplies and equipment.

AS: Score of 95% because the AS has more than 45 storerooms, most of which are designated for submarine supply storage. As her mission would no longer be to tend Los Angeles Class Attack Submarines, these store rooms could be utilized for the storage of HA/DR supplies and equipment

LHD/FFG: Score of 90% because of the inherent storage capability of the large deck amphibious ship, and the added capability of the FFG does not bring any extra storage capability.

HSV/RORO: Score of 100% because this combination is the only option analyzed that can easily carry all the HA/DR supplies and equipment and not be at, or close to maximum storage capacity.

Attribute Summary: The HSV/RORO alternative scored the highest because this attributes main consideration was storage space.

2.3.2 Maintenance: Maintenance includes actions taken to keep material in a serviceable condition or to upgrade its capability.

Overall Weight: 4

Maintenance was weighted low because it is not a key aspect of the mission. Most of the supplies and equipment GFS will be providing to the affected nation will be self-sufficient and not require maintenance. Ships crew will only be required to check expiration dates and perhaps be capable of making basic repairs to

generators and water purification systems. Overall, the HA/DR mission can be adequately performed with little to no maintenance capability.

Scoring Criteria: There are two sub-attributes in employing a successful maintenance capability. In scoring, the main consideration is cargo capacity for each platform. However, each platform inherently has a capability to perform maintenance on some of the required HA/DR equipment because of the personnel aboard. The following are the sub-attribute considerations when scoring the attributes:

2.3.2.1 **Keep material in a serviceable condition:** GFS will be responsible for the condition of all HA/DR equipment and stores to include tracking expiration dates and performing necessary PMS. The ship must be able to perform minor repairs and maintenance actions on the HA/DR equipment.

2.3.2.2 **Upgrade its capability:** GFS shall track published upgrades to HA/DR equipment and furnish the HA/DR supplies with upgrades as they become available. The ship should be able to perform and required upgrades to embarked HA/DR equipment.

CG: Score of 85% due to the crew's capability to perform basic maintenance on HA/DR equipment and supplies. The crew can be trained to complete most maintenance requirements, but will not have the training or expertise to perform complicated repairs on unfamiliar equipment.

LPD: Score of 85% due to the crew's capability to perform basic maintenance on HA/DR equipment and supplies. The crew can be trained to complete most maintenance requirements, but will not have the training or expertise to perform complicated repairs on unfamiliar equipment.

HSV: Score of 85% due to the crew's capability to perform basic maintenance on HA/DR equipment and supplies. The crew can be trained to complete most maintenance requirements, but will not have the training or expertise to perform complicated repairs on unfamiliar equipment.

AS: Score of 95% due to exceptional inherent repair capability. An AS is capable of maintenance, repairs, and performing any required upgrades to the HA/DR equipment. Because of the extra facilities, the AS can perform complicated repairs; however, it did not score 100% because the personnel on board may not be qualified to perform maintenance on more complicated HA/DR equipment.

LHD/FFG: Score of 85% due to the crew's capability to perform basic maintenance on HA/DR equipment and supplies. The crew can be trained to complete most maintenance requirements, but will not have the training or expertise to perform complicated repairs on unfamiliar equipment.

HSV/RORO: Score of 85% due to the crew's capability to perform basic maintenance on HA/DR equipment and supplies. The crew can be trained to complete most maintenance requirements, but will not have the training or expertise to perform complicated repairs on unfamiliar equipment. Due to the small size and civilian component of the RORO crew, they do not add any additional capability.

Attribute Summary: The AS scored the highest for the maintenance attribute because the specialized facilities it contains onboard. The specialized facilities would give more flexibility in conducting maintenance or repairs to the HA/DR equipment.

2.3.3 Transportation: Transportation is the movement of units, personnel, equipment and supplies from the point of origin to the final destination.

Overall Weight: 8

Transportation is necessary in moving supplies and equipment to affected areas.

Scoring Criteria: There are three sub-attributes to consider when examining the transportation attribute. The main consideration while scoring the transportation attribute is the platforms ability to move units, personnel and HA/DR equipment/supplies. As previously mentioned, the scenario begins with the platform at anchorage therefore the platform's

organic transportation assets play an important role in any relief effort. The following are the sub-attribute considerations when scoring the attributes:

2.3.3.1 **Movement of units:** GFS shall be responsible for moving HA/DR units (to include force protection and medical units to the disaster relief site as necessary. Ships should be able to transport units ashore and then to the affected region once ashore.

2.3.3.2 **Movement of personnel:** GFS shall be responsible for the transportation of personnel during an HA/DR operation to include evacuations if necessary. Ships should be able to transport personnel ashore and then to the affected region once ashore to include medical and NGO personnel as necessary.

2.3.3.3 **Movement of equipment and supplies:** GFS shall be responsible for the coordination of movement of equipment and supplies to the affected region. The ship must be able to off-load supplies and equipment both pier-side and at anchor, then transport the supplies and equipment to the affected region.

CG: Score of 30% due to the platform's inability to transport equipment ashore. The CG has the capability to carry two SH-60B helicopters. This provides it with some capability to transport supplies and equipment to shore; however, it is not capable of carrying land vehicles for transportation. This capability is limited even if the CG were to moor pier-side.

LPD: Score of 85%. The LPD-17 can embark two LCACs and 2 CH-46E and is capable for off-loading HA/DR equipment and supplies efficiently. LPD-17 also has the ability to carry land vehicles onboard to assist in the transportation of the supplies and equipment once off-loaded. This platform would score 100% once pier-side.

HSV: Score of 85% due to the ability to off-load the equipment both pier-side and at anchor with helicopters, crane and stern ramp capabilities. This platform would score 100% once it is pier-side.

AS: Score of 85% due to the ability to off-load supplies and equipment pier-side. The AS would not be able to off-load at anchor without the assistance of air maritime assets to transport supplies. This platform would score 100% pier-side.

LHD/FFG: Score of 90% because the LHD has many organic assets which enable to off-load equipment rapidly. The FFG lends little to this attribute with the exception of two additional helicopters. This combination of platforms would score 100% once the platforms are pier side.

HSV/RORO: Score of 95% due to the exceptional off-load capabilities of both the HSV and the RORO and the shallow draft of the HSV allowing for more opportunity to go pier-side. These platforms score slightly better than the LHD/FFG combination because of the shallow of the HSV.

Attribute Summary: The HSV/RORO alternative scored the best for this attribute because the combination of its off-load capabilities and shallow draft.

2.3.4 Civil Engineering: Civil engineering provides the construction, operation, maintenance, damage repair, and reconstitution of facilities, roads, utilities and logistic infrastructure.

Overall Weight: 4

Civil engineering will not necessarily be the primary mission of GFS in an HA/DR situation. Civil engineering, while important to rebuilding the infrastructure, after a disaster this requirement will likely fall on the shoulders of other agencies once a more permanent footprint is made in the affected nation. Civil engineering on the part of the GFS will only be to ensure that roadways, airports and seaports are safe for relief personnel and able to provide the means to supply the nation with first response supplies and equipment.

Scoring Criteria: There are five sub-attributes to consider when examining the civil engineering attribute. The main consideration while scoring the civil

engineering attribute is the platforms ability to store supplies to support construction efforts ashore. The following are the sub-attribute considerations when scoring the attributes:

2.3.4.1 **Construction:** GFS shall provide equipment, coordination and personnel necessary to assist in infrastructure rebuilding as necessary. The ship may be required to assist the host nation in reconstructing key buildings.

2.3.4.2 **Operation:** GFS shall be responsible for the proper operation of required civil engineering equipment embarked onboard. Ships crew should be able to operate any construction equipment stored onboard the platform, or provide berthing for the necessary personnel to do so.

2.3.4.3 **Maintenance:** GFS shall be responsible for all maintenance that is required to be performed on all equipment onboard GFS. Ships crew should be able to perform maintenance on any construction equipment stored onboard the platform, or provide berthing for the necessary personnel to do so.

2.3.4.4 **Damage repair:** GFS shall be responsible for all repairs necessary on civil engineering equipment due to use in an HA/DR environment. Ships crew should be able to repair any construction equipment stored onboard the platform, or provide berthing for the necessary personnel to do so.

2.3.4.5 **Reconstitution of facilities, roads, utilities and logistic infrastructure:** GFS shall be responsible to assist host nations in basic infrastructure repair following a disaster to which GFS responded. The ship should have the capability to assist the HN and NGOs in basic infrastructure rebuilding, especially if the infrastructure is to be repaired to assist in the transportation of supplies and equipment to the affected region

CG: score of 40%. Ticonderoga Class Cruisers are not able to provide the civil-military engineering support to successfully conduct HA/DR operations. This platform's inability to transport construction equipment and supplies due to available space limitations, in addition to trained personnel, prevents the establishment of physical networking in support of the infrastructure function. The score of 40% represents that the CG has some ability to transport materials once on-scene through the use of its helicopter assets, but has a deficiency in delivering the materials and personnel to the region in order to establish necessary facilities in support of HA/DR operations.

LPD: score of 85%. San Antonio Class LPDs have the ability to transport 2 Landing Craft, Air Cushions (LCAC) and accommodate 2 CH-46E Sea Knights, in addition to 24,000 square foot vehicle space and 34,000 cubic foot of cargo space.[154] These capabilities, along with personnel embarkation, allow this platform to support the civil-military engineering measures required by the physical networking attribute. A score 85% was awarded based on the platform's available transportation assets and its cargo storage capacity.

HSV: score of 90%. HSV has a 4,000 square foot flight deck and hangar capable of accommodating a SH-60B Seahawk helicopter which provides a means to transport cargo and personnel to relief sites. In addition to the vertical cargo/personnel transfer capabilities, HSV has the ability to launch/recover small craft or unmanned vehicles up to 13-tons underway, and transfer as much as 11-tons of cargo from the flight deck to adjacent ships or pier-side utilizing the shipboard crane.[155] These options allow for better on-load/off-load management of equipment, supplies and personnel essential to the rapid establishment of the physical network. HSV has a cargo capacity of 680 tons (comparable to 17 C-17

154. Jane's Fighting Ships, "San Antonio class: Amphibious Transport Docks (LPDM)," http://www4.janes.com/subscribe/jfs/doc_view.jsp?K2DocKey=/content1/janesdata/yb/jfs/jfs_3566.htm@current&Prod_Name=JFS&QueryText=%3CAND%3E%28%3COR%3E%28%28%5B80%5D%28+lpdm+or+%27United+States%27%29+%3CIN%3E+body%29%2C+%28%5B100%5D+%28%5B100%5D%28+lpdm+or+%27United+States%27%29+%3CIN%3E+title%29+%3CAND%3E+%28%5B100%5D%28+lpdm+or+%27United+States%27%29+%3CIN%3E+body%29%29%29%29.

155. Harold Kennedy, "Navy's High Speed Vessel Aids Relief Effort," *NationalDefenseMagazine*, http://www.nationaldefensemagazine.org/issues/2005/Nov/Navys_High.htm.

aircraft) and a draft of approximately 12 feet (comparable to a Cyclone-class patrol craft).[156] This platform meets the requirements to store, transport, provide and sustain construction equipment, personnel, and supplies to establish facilities, as well as routes and modes of transportation. A score of 90% was given because the platforms transportation assets do not allow for maximum flow of equipment and supplies from the sea (scenario has the GFS initially anchored). Once pier side this score would improve to 100%.

AS: score of 60%. Submarine tenders are able to provide civil-military engineering support to the HA/DR operation through the use of diversified facilities and cargo capacity. A helicopter platform is available; however it is not possible to embark aviation assets onboard, making it difficult to transport equipment and supplies without being pier-side or having a helicopter available ashore or on another vessel. Even with the amount of storage space available, the lack of transportation assets affected the overall scoring of the AS.

LHD/FFG: score of 95%. A LHD has the capability to transport 3 LCACs and multiple combinations of fixed-wing and rotary-wing aircraft. (for example 42 CH-45E Sea Knights can be accommodated). The aviation detachment for this thesis is 12 CH-46E Sea Knights and 9 CH-53E Super Stallion. The Super Stallion has a personnel capacity of 55 and external cargo capacity of 36,000 pounds.[157] In addition to the air assets onboard the LHD, an FFG is able to embark two SH-60B Seahawk helicopters. A frigate does not provide adequate cargo space; however the LHD has 125,000 cubic foot cargo capability and an additional 20,000 square foot for vehicle storage. The civil-engineering materials and equipment requirements can be stored and transported onboard, as well as

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156. Bobby Northnagle, "Swift Delivery Showcases Versatility," *Navy.mil,* http://www.navy.mil/search/display.asp?story_id=24698.

157. Jane's All the World's Aircraft, "Sikorsky Aircraft: Sikorsky S-80/H-53E," http://www4.janes.com/subscribe/jawa/doc_view.jsp?K2DocKey=/content1/janesdata/yb/jawa/jawa1456.htm@current&Prod_Name=JAWA&QueryText=%3CAND%3E%28%3COR%3E%28%28%5B80%5Dh-53e+%3CIN%3E+body%29%2C+%28%5B100%5D+%28%5B100%5Dh-53e+%3CIN%3E+title%29+%3CAND%3E+%28%5B100%5Dh-53e+%3CIN%3E+body%29%29%29%29.

additional HA/DR cargo. This combination makes it possible to accomplish all the measures set forth by the physical networking attribute. The LHD and FFG platforms are able to establish and sustain facilities, as well as provide and maintain routes and modes of transportation utilizing the embarked assets.

HSV/RORO: score of 95%. As stated before, the HSV is capable of fulfilling the physical network attribute. For example, the 1ST LT HARRY L MARTIN, is capable of providing 168,547 square feet of cargo space in addition to the HSV. Although this platform is unable to embark aircraft, there is a helicopter platform available for vertical cargo/personnel transport. As with the HSV, the RORO is able to provide civil-military engineering support to conduct HA/DR operations.[158] This combination received a score of 95% because the extra capacity that the RORO brings however, the RORO does not have the necessary transportation assets. Again the scenario starts at sea, but once the platforms can go pier-side this number will increase to 100%.

Attribute Summary: The LHD/FFG and HSV/RORO alternatives scored equally will for this attribute because both alternatives have enough cargo space to carry the materials needed for the civil engineering attribute.

2.3.5 Other Services: Other services are non-material support activities provided by service personnel and the logistics community that are essential to force support.

Overall Weight: 5

Other Services encompasses so many other aspects of the HA/DR mission; however, most overlap (are covered by) other sections of this study, to include medical and communications.

Scoring Criteria: There is one sub-attribute to consider when examining the Other Services attribute. The main consideration while scoring the Civil Engineering attribute is the platform's ability to store supplies to support

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158. GlobalSecurity.org, "TAK 3015 1st Lt Harry L. Martin, Maritime Pre-positioning Force (Enhanced) MPF(E)," http://www.globalsecurity.org/military/systems/ship/tak-3015-specs.htm.

construction efforts ashore. The following are the sub-attribute considerations when scoring this attribute:

2.3.5.1 Nonmaterial support activities provided by service personnel and the logistics community that are essential to force support: GFS shall be responsible for providing personnel, equipment and supplies as necessary for HA/DR efforts not previously outlined here. The GFS platform should be able to provide basic communications, administration support and medical capability to the HA/DR mission.

CG: Score of 80%. It possesses the capability to lend communications, and administration support during an HA/DR mission. The CG does not have the capability of embarking the number of medical personnel and equipment required to adequately support a disaster relief effort.

LPD: Score of 85% due to the ability of the ship and crew to lend communications and administration support to the HA/DR mission as well as her ability to embark medical personnel and equipment.

HSV: Score of 85% due to the ability of the ship and crew to lend communications and administration support to the HA/DR mission as well as her ability to embark medical personnel and equipment.

AS: Score of 90% due to the ability to lend communication and administration support to the mission as well as her inherent medical facilities and expertise.

LHD/FFG: Score of 80% due to the capability of the ship and her crew to lend communications and administration support during an HA/DR mission. Again the FFG lends little advantage in this combination over the LPD.

HSV/RORO: Score of 85% due to the HSV’s ability of the ship and her crew to lend communications and administration support to the HA/DR mission as well as her ability to embark medical personnel and equipment. The RORO adds little value to this attribute in this combination.

2.4 Communications: This function identifies the need to provide and maintain the continuous flow of information in the HA/DR disaster scenario.

The following is a brief overview of the communication capabilities of the platforms evaluated for FNA. These communication characteristics and capabilities provide the foundation for which each platform was graded in the context of the specific HA/DR scenario.

Platform Communication Capabilities

LHD

- Voice / Data Communications
  - UHF LOS / SATCOM
  - HF
  - VHF
  - EHF
  - SHF
- Challenge Athena
  - Voice, Data, Video, Imagery
- INMARSAT B
  - Compete for Satellite access
  - SIPRNET/NIPRNET
  - FSM
  - NetPrec- GCCS-M reporting
  - POTS
- Link 16

LPD-17

- Voice / Data Communications
  - UHF LOS / SATCOM
  - HF
  - VHF
  - EHF
  - SHF
- Challenge Athena
  - Voice, Data, Video, Imagery
- Link 16

Figure 57: LHD and LPD-17 Communication Capabilities

LHDs and LPDs have the most robust communication suites of any amphibious ships currently in use. The communication equipment on these platforms (Figure 57) provides them the capability to receive and transmit information via the various mediums and spectrums, thus providing key decision-makers with accurate and timely situational awareness.

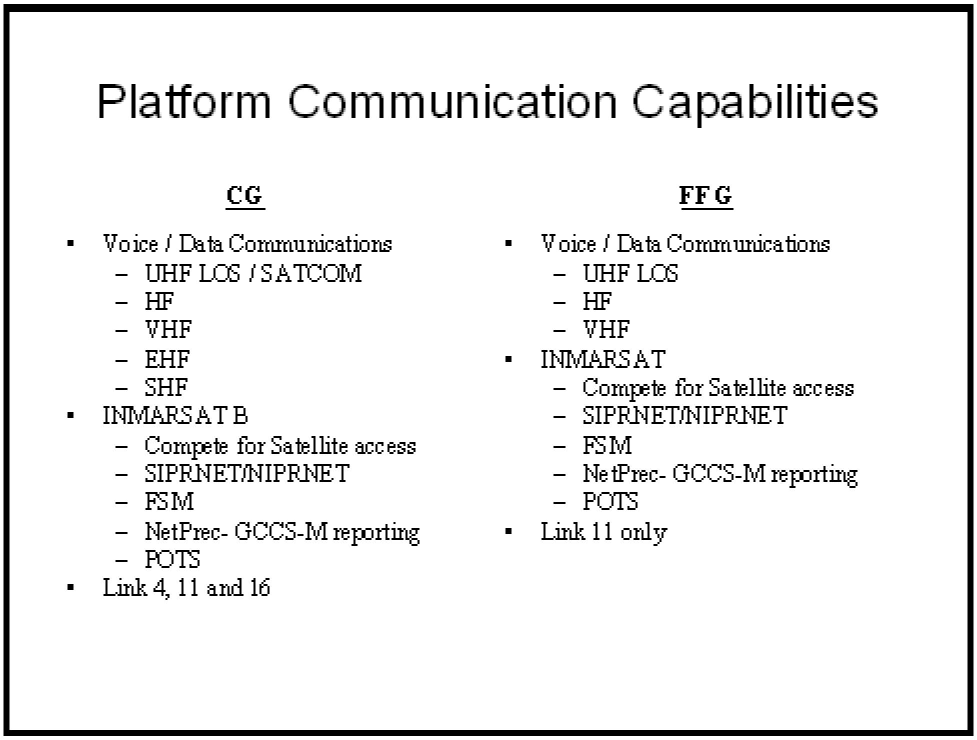

Figure 58: CG and FFG Communication Capabilities

CGs have the most robust communication suite of any surface combatant. Comparable to the LHD and LPD-17, the communication equipment on this platform provides it the capability to receive and transmit information via the various mediums and spectrums, thus providing key decision-makers with accurate and timely situational awareness.

FFGs have an adequate communication suite, but the lack of satellite communication equipment limits its effectiveness as a command and control platform during a HA/DR response effort. Another drawback regarding the FFG is its limited communication spectrum range and its lack of communication gear redundancy.

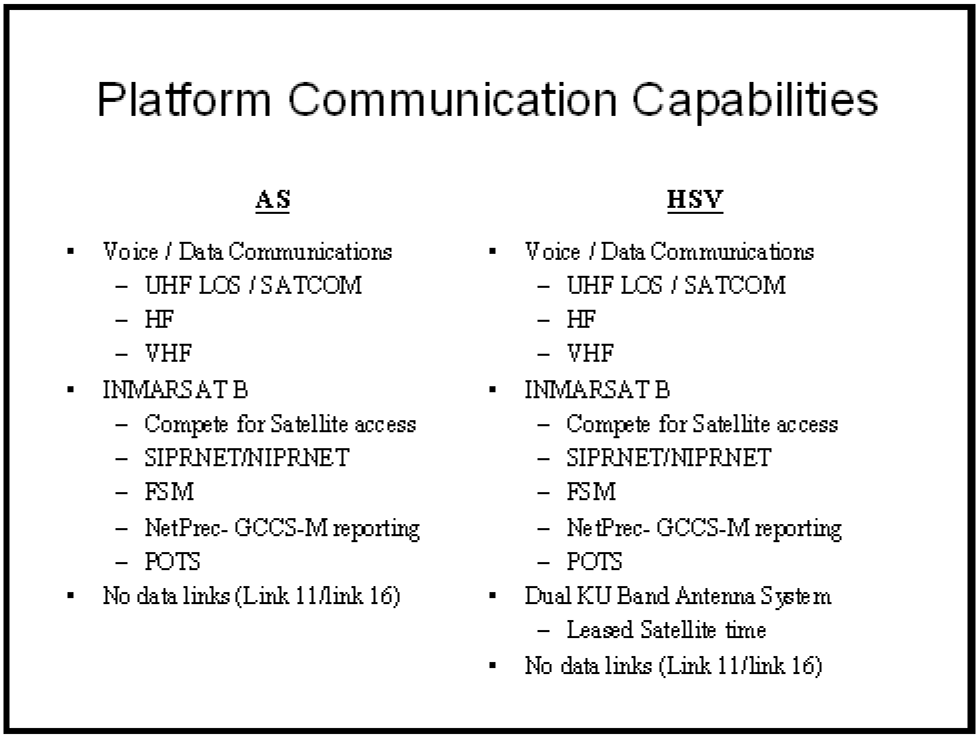

Figure 59: AS and HSV Communication Capabilities

The AS and HSV have adequate, but limited communication suites based on their minimal satellite communication capabilities and overall lack of SHF or data links (Figure 59). These platforms can effectively serve in a HA/DR command and control role, however these communication limitations could become a significant issue to decision-makers should the disaster be located in regions of the world with limited or restricted INMARSAT coverage.

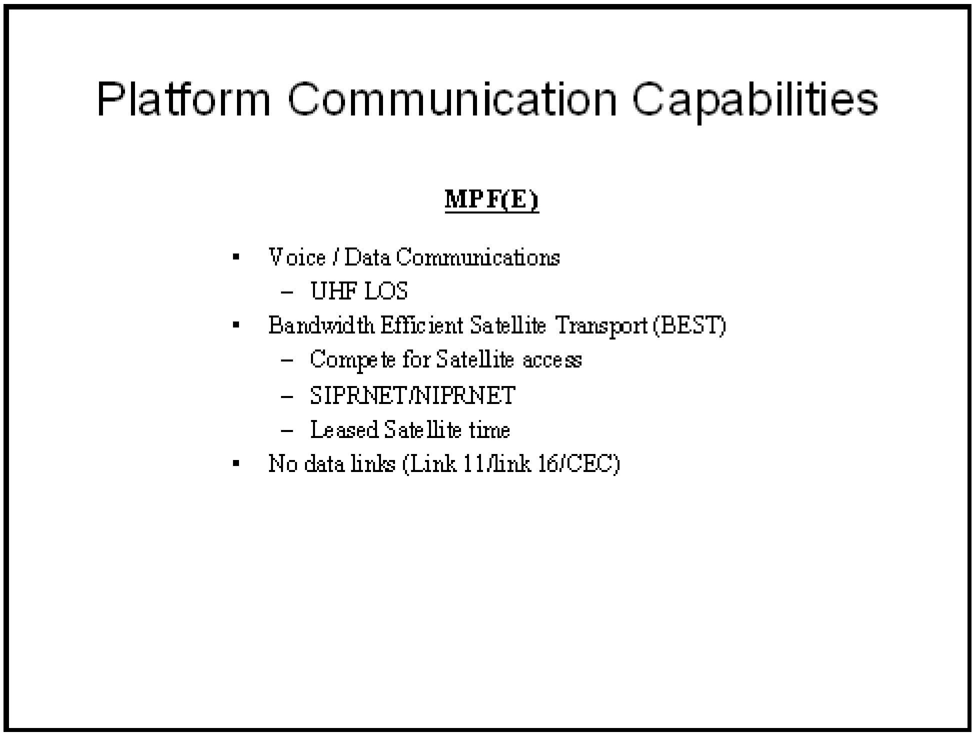

Figure 60: RORO Communication Capabilities

MPF(E) ships have an adequate, but extremely limited communication suite (Figure 60) based on its lack of HF, EHF, and SHF communication equipment and data links. Although the "Bandwidth Efficient Satellite Transport" (BEST) system provides the RORO with secure and non-secure voice, data, and imagery connectivity, access is still dependent on system availability, bandwidth allocation, and geographic location.

It should be noted that each of the platforms evaluated provide some varying degree of communication proficiency, but these capabilities are focused in a command and control role. None of the platforms evaluated have an embedded capability to deploy or project communication and networking technologies into a disaster area. The ideal deployable disaster relief communications system should 1) be easily scalable to meet growing needs during the relief effort, rapidly extending its reach to any geographical location, 2) offer user-friendly configurations, 3) enable management and maintenance, 4) provide a small footprint for ease of transportation, 5) support any mix of voice, data and video applications, and 6) require minimal power. Without this ability of first

responders to communicate the moment they arrive on scene, they cannot effectively assess options, develop response plans, or coordinate relief efforts.

2.4.1 Access Services – These services provide the foundation for all Department of Defense communication assets in order to provide the required connectivity and promote the timely free flow of information. Access services are comprised of three specific Global Information Grid (GIG) Services: Defense Information Systems Network Interface (DISN), Standardized Tactical Entry Point (STEP), and Department of Defense Teleport.

Overall Weight: 9

The capability of a platform to provide access to services, thus enabling information flow between first responders and decision-makers is essential.

Grading Criteria: Grading was focused on evaluating the ability of a platform to establish and maintain connectivity to these three services. The evaluation itself was primarily based on existing communication assets provided onboard each individual platform. The following sub-attributes were considered:

2.4.1.1 Defense Information Systems Network Interface (DISN): Department of Defense's worldwide enterprise-level telecommunications infrastructure providing end-to-end information transfer for supporting military operations. It provides GIG network services to Department of Defense installations and deployed forces. Those services include voice, data, and video.

2.4.1.1.1 Utilize the DISN: GFS shall have the capability and capacity to utilize the DISN to support exchange of voice, data, imagery, and video from strategic to tactical levels, at all echelons, when deployed.

2.4.1.1.2 Provide and Maintain Communications: GFS shall have the capability and capacity to obtain, relay, and distribute data and information by any means including

establishing communication links with service, joint, interagency, intra-agency, and coalition forces.

2.4.1.1.3 **Transmit and Receive Information:** GFS shall have the capability and capacity to send and receive information between units and/or higher formations or commands to build the overall picture.

2.4.1.1.4 **Provide External Communications:** GFS shall have the capability and capacity to provide tactical information through the use of external communications systems.

2.4.1.1.5 **Manage Means of Communicating Information:** GFS shall have the capability and capacity to direct, establish, or control the instruments used in sending or receiving information and to use various communication networks and modes for obtaining or sending information.

2.4.1.2 **Standardized Tactical Entry Point (STEP):** The primary interface point between the sustaining base and deployed forces. The STEP program enhances the ability of the DISN to respond to the needs of the joint force. STEP provides predefined (tailored) support packages on a predefined timeline. This support is extended via common user transports and includes voice, data, and video services.

2.4.1.2.1 **Utilize the DISN:** GFS shall have the capability and capacity to utilize the DISN to support exchange of voice, data, imagery, and video from strategic to tactical levels, at all echelons, when deployed.

2.4.1.2.2 **Provide and Maintain Communications:** GFS shall have the capability and capacity to provide tactical information through the use of external communications systems.

2.4.1.2.3 Transmit and Receive Information: GFS shall have the capability and capacity to send and receive information between units and/or higher formations or commands to build the overall picture.

2.4.1.2.4 Manage Means of Communicating Information: GFS shall have the capability and capacity to direct, establish, or control the instruments used in sending or receiving information and to use various communication networks and modes for obtaining or sending information.

2.4.1.3 Department of Defense Teleport: Provides commercial and military satellite access at selected STEP sites to improve DISN service access to the deployed joint force.

2.4.1.3.1 Provide Radio Communications: GFS shall have the capability and capacity to provide HF/UHF/VHF and SATCOM radio communications support.

2.4.1.3.2 Provide and Maintain Communications: GFS shall have the capability and capacity to provide tactical information through the use of external communications systems.

2.4.1.3.3 Transmit and Receive Information: GFS shall have the capability and capacity to send and receive information between units and/or higher formations or commands to build the overall picture.

2.4.1.3.4 Provide External Communications: GFS shall have the capability and capacity to provide tactical information through the use of external communications systems.

2.4.1.3.5 Manage Means of Communicating Information: GFS shall have the capability and capacity to direct, establish, or control the instruments used in sending or receiving

information and to use various communication networks and modes for obtaining or sending information.

CG: A score of 100% is based on the ability of a CG to fully establish and maintain connectivity to all three GIG services.

LPD-17: A score of 100% is based on the ability of a LPD-17 to fully establish and maintain connectivity to all three GIG services.

HSV: A score of 100% is based on the ability of a HSV to fully establish and maintain connectivity to all three GIG services.

AS: A score of 100% is based on the ability of an AS to fully establish and maintain connectivity to all three GIG services.

LHD/FFG: A score of 100% is based on the ability of the LHD and FFG to fully establish and maintain connectivity to all three GIG services. Pairing the FFG with the LHD provides no real communications benefit with regard to these three services.

HSV/RORO: A score of 100% is based on the ability of a HSV to fully establish and maintain connectivity to all three GIG services. Pairing the HSV with the MPF(E) provides no real communications benefit with regard to these three services.

Attribute Summary: All of the platforms, either individually or as paired, were capable of meeting the requirements of this attribute.

2.4.2 Voice Services – These services are the primary means of garnering an overall situational awareness in an HA/DR environment and thus provide first responders with the capability to most effectively and efficiently employ and distribute essential personnel and resources. Non-voice communications can become an important requirement (narrowband, wideband and broadband data applications), dependent on the nature of the disaster, however, the need for voice communications will always be a major requirement. Voice communications includes the Defense Switched Network (DSN), Mobile, and Tactical Voice.

Overall Weight: 7

The capability of a platform to provide voice communication services between first responders and decision-makers in an austere environment is very important.

Grading Criteria: Grading was focused on evaluating the ability of a platform to establish, employ, and maintain connectivity over these three types of voice circuits (I.E. DSN-STU-III/STE; Mobile-Iridium, Tactical-NAVY RED). The evaluation itself was primarily based on existing communication assets provided onboard each individual platform.

CG: A grade of 100% is based on the ability of a CG to establish, maintain, and employ voice communications, as required, utilizing all three-voice communication services.

LPD-17: A grade of 100% is based on the ability of a LPD-17 to establish, maintain, and employ voice communications, as required, utilizing all three-voice communication services.

HSV: A grade of 100% is based on the ability of a HSV to establish, maintain, and employ voice communications, as required, utilizing all three-voice communication services.

AS: A grade of 100% is based on the ability of an AS to establish, maintain, and employ voice communications, as required, utilizing all three voice communication services.

LHD/FFG: A grade of 100% is based on the ability of a LHD to establish, maintain, and employ voice communications, as required, utilizing all three-voice communication services. Pairing the FFG with the LHD provides no real communications benefit with regard to these voice services.

HSV/RORO: A grade of 100% is based on the ability of a HSV to establish, maintain, and employ voice communications, as required, utilizing all three-voice communication services. Pairing the HSV with the MPF(E) provides no real communications benefit with regard to these voice services.

2.4.2.1 Defense Switched Network (DSN): A standard unclassified voice network supporting Department of Defense.

2.4.2.1.1 Provide Telephone Communications: GFS shall have the capability and capacity to provide communication connectivity between operational forces and the Naval Telecommunications System and Defense Communications System, as required. This includes installing, operating, and maintaining network control facilities, system control facilities, message centers, radio links, and tactical switchboard/telephone systems.

2.4.2.1.2 Provide External Communications: GFS shall have the capability and capacity to provide tactical information through the use of external communications systems.

2.4.2.1.3 Control Communication Nets: GFS shall have the capability and capacity to ensure controlled nets (voice and data) carry information appropriate to their function.

2.4.2.2 Defense Red Switched Network (DRSN): A classified voice network supporting Department of Defense.

2.4.2.2.1 Provide External Communications: GFS shall have the capability and capacity to provide tactical information through the use of external communications systems.

2.4.2.2.2 Control Communication Nets: GFS shall have the capability and capacity to ensure controlled nets (voice and data) carry information appropriate to their function.

2.4.2.3 Enhanced Mobile Satellite Services: Commercial, portable satellite systems that are capable of voice and data transmission.

2.4.2.3.1 Provide External Communications: GFS shall have the capability and capacity to provide tactical

information through the use of external communications systems.

2.4.2.3.2 Control Communication Nets: GFS shall have the capability and capacity to ensure controlled nets (voice and data) carry information appropriate to their function.

2.4.2.4 Tactical Voice: Military specific switching system capable of operating in austere areas.

2.4.2.4.1 Provide External Communications: GFS shall have the capability and capacity to provide tactical information through the use of external communications systems.

2.4.2.4.2 Control Communication Nets: GFS shall have the capability and capacity to ensure controlled nets (voice and data) carry information appropriate to their function.

Attribute Summary: All of the platforms, either individually or as paired, were capable of meeting the requirements of this attribute.

2.4.3 Data Services – These services are focused on networks that distribute a broad range of data and/or information (ranging from tactical, classified, to unclassified). Data Services are comprised of the Joint Data Network (JDN), Non-Secure Internet Protocol Router Network (NIPRNET), SECRET Internet Protocol Router Network (SIPRNET), Wide-Area Network (WAN)/ Local-Area Network (LAN), and Joint Worldwide Intelligence Communications System (JWICS).

Overall Weight: 7

The capability of a platform to establish and maintain data network services between first responders and decision-makers in an austere environment is very important. The availability of these data networks enables widespread

dissemination of critical information, thereby permitting first responders and decision-makers to react more efficiently and effectively.

Grading Criteria: Grading was focused on evaluating the ability of a platform to establish and maintain connectivity over these data networks. The evaluation itself was primarily based on whether each individual platform had the capability (i.e. necessary equipment) and personnel required to operate these data networks.

2.4.3.1 Joint Data Network (JDN): A compilation of sub-networks that are comprised of a wide variety of data systems that carry a broad range of tactical information on tactical digital information links (TADL) within a theater in support of joint and multinational war fighting.

2.4.3.1.1 Provide External Communications: GFS shall have the capability and capacity to provide tactical information through the use of external communications systems.

2.4.3.1.2 Control Communication Nets: GFS shall have the capability and capacity to ensure controlled nets (voice and data) carry information appropriate to their function.

2.4.3.2 Non-Secure Internet Protocol Router Network (NIPRNET): A computer network for unclassified, but sensitive information supporting Department of Defense.

2.4.3.2.1 Provide External Communications: GFS shall have the capability and capacity to provide information through the use of external communications systems.

2.4.3.2.2 Control Communication Nets: GFS shall have the capability and capacity to ensure controlled nets (voice and data) carry information appropriate to their function.

2.4.3.3 SECRET Internet Protocol Router Network (SIPRNET): A computer network for classified information (up to SECRET) supporting Department of Defense.

2.4.3.3.1 Provide External Communications: GFS shall have the capability and capacity to provide tactical information through the use of external communications systems.

2.4.3.3.2 Control Communication Nets: GFS shall have the capability and capacity to ensure controlled nets (voice and data) carry information appropriate to their function.

2.4.3.4 Coalition/Multinational Wide-Area Network (WAN): A computer network supporting the combined/multinational operations that may be unclassified or classified.

2.4.3.4.1 Provide Wide Area Networks (WAN)/Local Area Networks (LAN) Communications: GFS shall have the capability and capacity to provide tactical WAN and LAN data communications networks to support information exchange, collaboration, and resource sharing in a particular agency, facility, center, cell, or geographic location.

2.4.3.4.2 Provide External Communications: GFS shall have the capability and capacity to provide tactical information through the use of external communications systems.

2.4.3.4.3 Control Communication Nets: GFS shall have the capability and capacity to ensure controlled nets (voice and data) carry information appropriate to their function.

2.4.3.5 Joint Worldwide Intelligence Communications System (JWICS): A computer network for classified information, including SCI, supporting Department of Defense

2.4.3.5.1 Provide External Communications: GFS shall have the capability and capacity to provide tactical information through the use of external communications systems.

2.4.3.5.2 Control Communication Nets: GFS shall have the capability and capacity to ensure controlled nets (voice and data) carry information appropriate to their function.

CG: A grade of 100% is based on the ability of a CG to establish, maintain, and employ all of these data networks to facilitate the dissemination of information in support of HA/DR response efforts. The following sub-attributes were considered:

LPD-17: A grade of 100% is based on the ability of a LPD-17 to establish, maintain, and employ all of these data networks to facilitate the dissemination of information in support of HA/DR response efforts.

HSV: A grade of 100% is based on the ability of a HSV to establish, maintain, and employ all of these data networks to facilitate the dissemination of information in support of HA/DR response efforts.

AS: A grade of 80% is based on the ability of a HSV to establish, maintain, and employ some of these data networks to facilitate the dissemination of information in support of HA/DR response efforts. The data services limitations regarding the AS involve its reduced satellite communication capability (INMARSAT dependent) and, less significantly, its lack of JWICS.

LHD/FFG: A grade of 100% is based on the ability of a LHD to establish, maintain, and employ all of these data networks to facilitate the dissemination of information in support of HA/DR response efforts. Pairing the FFG with the

LHD provides no real communications benefit with regard to these data services considering the FFGs limited satellite communication capability.

HSV/RORO: A grade of 100% is based on the ability of a HSV to establish, maintain, and employ all of these data networks to facilitate the dissemination of information in support of HA/DR response efforts. Pairing the HSV with the MPF(E) provides no real communications benefit with regard to these data services considering both platforms rely solely upon commercially leased satellite communication architecture for these services.

Attribute Summary: All of the platforms, with the exception of the AS, were capable of meeting the requirements of this attribute. The reliance on access to satellite communication networks is an important consideration for this attribute. Simply having the equipment and personnel onboard does not necessarily mean that a platform will have the capability to obtain and/or disseminate information on these networks. Having dedicated satellite lease time and bandwidth could significantly impact the overall success or failure of a HA/DR response effort.

2.4.4 Applications – These are software programs and networks designed to handle specific types of information and provide operators with certain capabilities. These applications included Global Command and Control System (GCCS), Defense Message System (DMS), and Defense Collaboration Tool Suite (DCTS).

Overall Weight: 7

The availability of these application services during a HA/DR response effort supports the dissemination of critical information (i.e. via DMS), thereby permitting decision-makers located outside of the operational area to react more efficiently and effectively to support on-scene relief efforts.

Grading Criteria: Grading was focused on evaluating the ability of a platform to maintain and employ these applications. The evaluation itself was primarily based on whether each individual platform had the capability (i.e. necessary

equipment) and personnel required to operate these specific application tools. The following sub-attributes were considered:

2.4.4.1 **Global Command and Control System (GCCS):** A suite of software applications and hardware designed for planning, execution, C2 of forces, data, information and multi-discipline intelligence processing.

2.4.4.1.1 **Utilize the Global Command and Control System (GCCS):** GFS shall have the capability and capacity to utilize GCCS in order to provide a fused and shared picture of the operational area, together with the essential planning and assessment tools required by combatant commanders and their subordinate commanders.

2.4.4.1.2 **Provide External Communications:** GFS shall have the capability and capacity to provide tactical information through the use of external communications systems.

2.4.4.2 **Defense Message System (DMS):** A multilevel secure system for transmission of record message traffic in support of Department of Defense.

2.4.4.2.1 **Provide Electronic Message Communications:** GFS shall have the capability and capacity to utilize DMS so that secure, timely, reliable writer-to-reader messaging service is available across strategic and deployed environments.

2.4.4.2.2 **Provide External Communications:** GFS shall have the capability and capacity to provide tactical information through the use of external communications systems.

2.4.4.3 Defense Collaboration Tool Suite (DCTS): A Department of Defense tool suite for interoperable collaboration. DCTS provides combatant commands, Services, and agencies with an interoperable, real time asynchronous collaboration capability that includes voice and video conferencing, document and application sharing, instant messaging, virtual meeting, and whiteboard capability in support of Department of Defense planning.

2.4.4.3.1 Provide External Communications: GFS shall have the capability and capacity to provide tactical information through the use of external communications systems.

CG: A grade of 100% is based on the ability of a CG to maintain and operate all of these application tools in support of HA/DR response efforts.

LPD-17: A grade of 100% is based on the ability of a LPD-17 to maintain and operate all of these application tools in support of HA/DR response efforts.

HSV: A grade of 100% is based on the ability of a HSV to maintain and operate all of these application tools in support of HA/DR response efforts.

AS: A grade of 100% is based on the ability of an AS to maintain and operate all of these application tools in support of HA/DR response efforts.

LHD/FFG: A grade of 100% is based on the ability of a LHD to maintain and operate all of these application tools in support of HA/DR response efforts. Pairing the FFG with the LHD provides no real communications benefit, other than redundancy, with regard to these application services. Individually, the FFG would score a grade of 100% because it possesses all of these application tools.

HSV/RORO: A grade of 100% is based on the ability of a HSV to maintain and operate all of these application tools in support of HA/DR response efforts. Pairing the HSV with the MPF(E) provides no real communications benefit with regard to these application services because of the MPF(E)'s limited communication suite.

Attribute Summary: All of the platforms, either individually or as paired, were capable of meeting the requirements of this attribute.

2.4.5 Video Services – These services provide the capability to transmit and receive video communication signals to and from the operational area. The importance of these video services, particularly Video Teleconferencing (VTC), cannot be understated. In its simplest form video services would include commercial news feeds, but it can also include classified or unclassified Video Teleconferencing (VTC).

Overall Weight: 6

The capability of a platform to establish, maintain and employ these video services in coordinating and supporting the overall HA/DR response efforts is important. The availability of these video services during a HA/DR response effort enhances communication between first responders and decision-makers. These services enable decision-makers and specialists (i.e. area, medical, infrastructure) located outside of the disaster area to provide real-time support to supplement the on-scene relief effort.

Grading Criteria: Grading was focused on evaluating the ability of a platform to establish, maintain, and employ these video transmissions. The evaluation itself was primarily based on whether each individual platform had the capability (i.e. necessary equipment) and personnel required to receive, transmit, and operate these video services as required. The following sub-attributes were considered:

2.4.5.1 Defense Video Teleconferencing (VTC) System (Global): A classified, closed video network capable of voice, image, and data exchange supporting C2 functions of Department of Defense.

2.4.5.1.1 Provide External Communications: GFS shall have the capability and capacity to provide tactical information through the use of external communications systems.

2.4.5.1.2 Control Communication Nets: GFS shall have the capability and capacity to ensure controlled nets (voice and data) carry information appropriate to their function.

2.4.5.2 SCI-Level VTC: A classified, closed video network capable of voice, image, and data exchange supporting intelligence, and C2 functions of Department of Defense.

2.4.5.2.1 Provide External Communications: GFS shall have the capability and capacity to provide tactical information through the use of external communications systems.

2.4.5.2.2 Control Communication Nets: GFS shall have the capability and capacity to ensure controlled nets (voice and data) carry information appropriate to their function.

2.4.5.3 Commercial News Feed: Commercial news feeds may be rebroadcast over Department of Defense communications system or received via a commercially leased terminal.

2.4.5.3.1 Provide External Communications: GFS shall have the capability and capacity to provide tactical information through the use of external communications systems.

2.4.5.3.2 Control Communication Nets: GFS shall have the capability and capacity to ensure controlled nets (voice and data) carry information appropriate to their function.

CG: A grade of 100% is based on the ability of a CG to maintain and operate all of these video services in support of HA/DR response efforts. This platform is capable of employing VTC and receiving commercial news feeds.

LPD-17: A grade of 100% is based on the ability of a CG to maintain and operate all of these video services in support of HA/DR response efforts. This platform is capable of employing VTC and receiving commercial news feeds.

HSV: A grade of 100% is based on the ability of a CG to maintain and operate all of these video services in support of HA/DR response efforts. This platform is capable of employing VTC and receiving commercial news feeds.

AS: A grade of 30% is based on the lack of VTC capability for the AS. This platform is only capable of receiving commercial news feeds.

LHD/FFG: A grade of 100% is based on the ability of a CG to maintain and operate all of these video services in support of HA/DR response efforts. This platform is capable of employing VTC and receiving commercial news feeds. Pairing the FFG with the LHD provides no real communications benefit, other than redundancy, with regard to these video services. Individually, the FFG would score a grade of 100% because it also possesses all of these video services.

HSV/RORO: A grade of 100% is based on the ability of an HSV/RORO combination to maintain and operate all of these video services in support of HA/DR response efforts. This platform is capable of employing VTC and receiving commercial news feeds. Pairing the HSV with the MPF(E) provides no real communications benefit with regard to these video services because the MPF(E) does not have a VTC capability.

Attribute Summary: All of the platforms, with the exception of the AS, were capable of meeting the requirements of this attribute. The lack of VTC equipment onboard the AS could be overcome by utilizing an IP-based video communication tool, however, it will not provide a medium for classified discussions. This attribute also has a strong reliance on access to satellite communication networks. Here again, simply having the equipment and personnel onboard does not equate to a platform having the capability to communicate using these video services. Having dedicated satellite lease time and bandwidth could improve the overall effectiveness of the relief operation by enabling relief entities to coordinate and collaborate over these video services.

2.4.6 Satellite Communication Services - Satellite-based communication services have become the backbone of many critical operations and disaster recovery plans. Satellites are the best and most reliable communication platform in these situations because fiber and terrestrial wireless networks can be disrupted by tsunamis, earthquakes, and hurricanes. Satellite communications are highly survivable (physical survivability and robustness) and independent of terrestrial infrastructure. They provide interoperability between disparate systems and networks, broadcast services over very wide areas, provide mobile wideband and narrow-band communications, and perform most effectively when terrestrial infrastructure is damaged, destroyed, or overloaded. Simply put, satellites provide individuals with an instant communication infrastructure. Satellite Communication Services is comprised of Wideband Services, Protected and Survivable Services, and Narrowband and Mobile Services. The satellite capabilities of the platforms evaluated are provided below, in Figure 61.

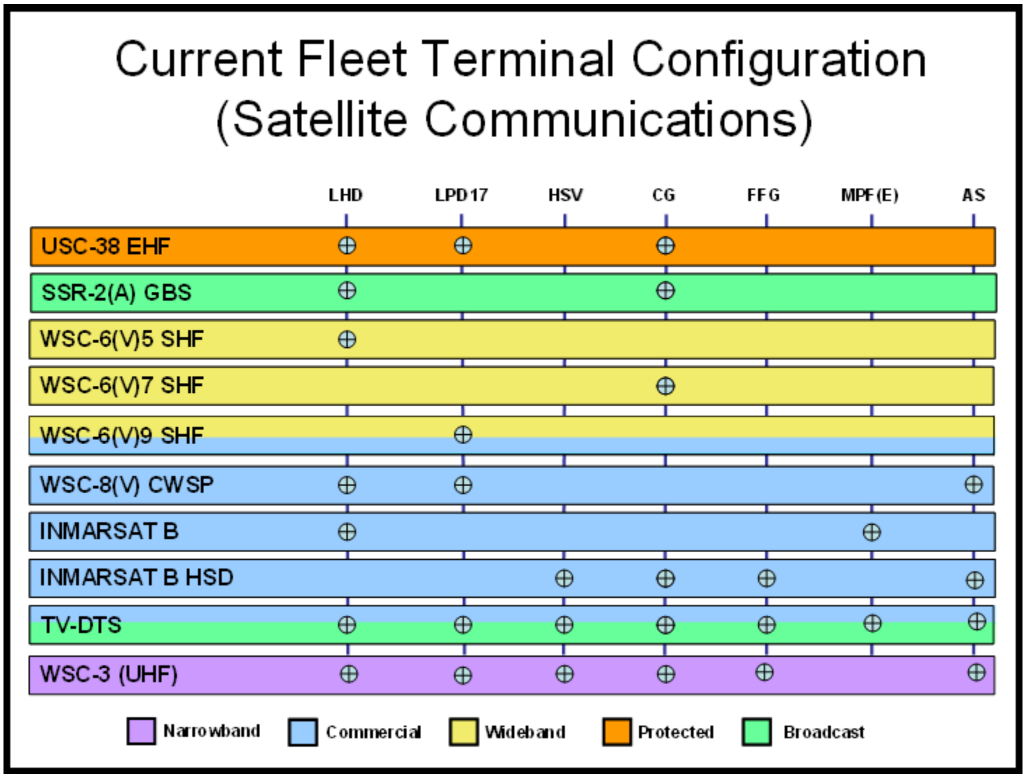

Figure 61: Platform Satellite Communication Capabilities

Overall Weight: 8

The capability of a platform to provide access to these satellite services enables information flow between first responders and decision-makers, regardless of location or proximity of participants.

Grading Criteria: Grading was focused on evaluating the ability of a platform to establish and maintain connectivity over these satellite networks. The evaluation itself was primarily based on the number and types of existing satellite communication assets available onboard each individual platform. The following sub-attributes were considered:

2.4.6.1 Wideband Services: Provide high-capacity and broadcast communications coverage to meet increasing demands for information from military-owned and commercially leased satellite systems.

2.4.6.1.1 Defense Satellite Communications System (DSCS): Provides a GIG transmission backbone of high capacity

C2, intelligence and multi-channel communications service for the CCDRs, Services, and agencies.

2.4.6.1.1.1 Provide External Communications: GFS shall have the capability and capacity to provide tactical information through the use of external communications systems.

2.4.6.1.1.2 Control Communication Nets: GFS shall have the capability and capacity to ensure controlled nets (voice and data) carry information appropriate to their function.

2.4.6.1.2 Global Broadcast Service (GBS): Provides a wide range of video and/or data services on a broadcast-only basis to widely dispersed elements.

2.4.6.1.2.1 Provide External Communications: GFS shall have the capability and capacity to provide tactical information through the use of external communications systems.

2.4.6.1.2.2 Control Communication Nets: GFS shall have the capability and capacity to ensure controlled nets (voice and data) carry information appropriate to their function.

2.4.6.2 Protected and Survivable Services: Provide anti-jam, nuclear-survivable and LPD, intercept, and exploitation of communications capabilities including polar coverage are provided by military-owned and operated systems.

2.4.6.2.1 Milstar: Supports strategic and tactical missions through secure global communications that are jam-resistant and survivable. Milstar is the core Department of Defense C2 communications system for US strategic and tactical combat forces in hostile environments.

2.4.6.2.1.1 **Provide External Communications:** GFS shall have the capability and capacity to provide tactical information through the use of external communications systems.

2.4.6.2.1.2 **Control Communication Nets:** GFS shall have the capability and capacity to ensure controlled nets (voice and data) carry information appropriate to their function.

2.4.6.3 **Narrowband and Mobile Services:** Provide phone and data transfer capability for netted, mobile, hand-held, paging, and low speed broadcast.

2.4.6.3.1 **Ultrahigh Frequency Follow-on (UFO) and Fleet Satellite Communications (FLTSATCOM):** Provide low-cost user terminals that are small and lightweight, and can be used while on the move, under adverse weather conditions and in dense foliage.

2.4.6.3.1.1 **Provide External Communications:** GFS shall have the capability and capacity to provide tactical information through the use of external communications systems.

2.4.6.3.1.2 **Control Communication Nets:** GFS shall have the capability and capacity to ensure controlled nets (voice and data) carry information appropriate to their function.

2.4.6.3.2 **International Maritime Satellite (INMARSAT):** Provides bulk use and pay-per-use alternatives that support information transfer requirements during both normal operations and periods of contingency or crisis.

2.4.6.3.2.1 **Provide External Communications:** GFS shall have the capability and capacity to

provide tactical information through the use of external communications systems.

2.4.6.3.2.2 **Control Communication Nets:** GFS shall have the capability and capacity to ensure controlled nets (voice and data) carry information appropriate to their function.

2.4.6.3.3 **Iridium:** Provides secure and non-secure voice and data services to Department of Defense tactical and non-tactical users.

2.4.6.3.3.1 **Provide External Communications:** GFS shall have the capability and capacity to provide tactical information through the use of external communications systems.

2.4.6.3.3.2 **Control Communication Nets:** GFS shall have the capability and capacity to ensure controlled nets (voice and data) carry information appropriate to their function.

CG: A grade of 90% is based on the ability of a CG to establish, maintain, and employ all three types of satellite communication services. This platform's satellite communication suite is comparable to that possessed by the LHD in terms of overall capability, with its only diminishing characteristic being the lack of access to the Commercial Wideband Satellite Program (provides JWICS, SIPRNET, NIPRNET, VTC, POTS, and message traffic at a rate of 1.544-2.048 Mbps).

LPD-17: A grade of 85% is based on the ability of a LPD-17 to establish, maintain, and employ all three types of satellite communication services. This platform's satellite communication suite is comparable to that possessed by the LHD and CG in terms of overall capability, with its only diminishing characteristic being the lack of access to the Global Broadcast Service (provides

UAV video, weather/intelligence imagery, and Fox/CNN News) and INMARSAT B.

HSV: A grade of 80% is based on the lack of satellite communication equipment and redundancy onboard HSV to establish, maintain, and employ all available satellite communication services. The HSV's dependence upon commercial INMARSAT, UHF SATCOM, mobile and a leased dual KU band antenna system for its satellite connectivity makes it a less attractive option with regards to this attribute.

AS: A grade of 45% is based on the limited satellite communication capability provided by the AS. This platform would be heavily dependent upon UHF SATCOM, INMARSAT, and mobile satellite communication in supporting HA/DR relief operations communication requirements. The lack of modern satellite communication technology and redundancy associated with this platforms' existing communication capability were major considerations in determining its low grade.

LHD/FFG: A grade of 100% is based on the ability of a LHD to establish, maintain, and employ all three types of satellite communication services. The LHD's robust satellite communication suite, which includes EHF, SHF, UHF SATCOM, INMARSAT, and GBS, clearly makes it the ideal platform with regards to this particular attribute. Pairing the FFG with the LHD provides no real communications benefit because of the FFGs limited satellite communication capability (INMARSAT and mobile).

HSV/RORO: A grade of 80% is based on the lack of satellite communication equipment and redundancy onboard HSV to establish, maintain, and employ all available satellite communication services, as required. The HSV's dependence upon commercial INMARSAT, UHF SATCOM, mobile, and a leased dual KU band antenna system for its satellite connectivity makes it a less attractive option with regards to this attribute. Pairing the MPF(E) with the HSV provides no real communications benefit because of the MPF(E)s limited satellite communication capability (reliant upon BEST for its satellite services).

Attribute Summary: The LHD has the most robust satellite communication suite of all platforms evaluated. The CG, LPD-17, and HSV had comparable satellite communication capabilities; the five to ten percent variance was largely a factor of the LHD being able to provide redundant connectivity or services. The poor evaluation for the AS regarding this trait is simply a result of the platform's lack of satellite communication additions or upgrades (likely considered unnecessary based on its mission as a submarine tender).

2.4.7 Communication Security – This security ensures the availability, integrity, identification, authentication, confidentiality, and non-repudiation of friendly communication systems while denying adversaries access to the same communication systems. It also incorporates those actions taken to protect, monitor, analyze, detect and respond to unauthorized activity within Department of Defense communication systems and networks. Communication Security is comprised of Physical Security, Personnel Security, and Operational Security.

Overall Weight: 5

Communication security measures protect the information, communication equipment, and personnel from ever-present probes and threats. Although the potential threat may be perceived as low for platforms operating in an austere environment, the numerous distractions and chaotic nature following a disaster could provide an ideal opportunity for determined adversaries to attack a platform's communication architecture.

Grading Criteria: Grading was focused on evaluating the ability of a platform to establish, maintain, and employ appropriate communication security measures as required while operating in an austere environment. This evaluation was primarily based on whether each individual platform had the capability (i.e. necessary equipment), directives, and personnel required to enact and enforce these security requirements. The following sub-attributes were considered:

2.4.7.1 Physical Security: Security with regards to the communications system components and facilities.

2.4.7.2 Personnel Security: Security with regards to individuals authorized access to the communications system.

2.4.7.3 Operational Security: Procedures and techniques protecting operational employment of the communications system components.

2.4.7.3.1 Information Assurance: Measures that protect and defend information and information systems by ensuring their availability, integrity, authentication, confidentiality, and non-repudiation. This includes providing for restoration of information systems by incorporating protection, detection, and reaction capabilities.

2.4.7.3.1.1 Provide Information Security: GFS shall have the capability and capacity to ensure the security of information and the communications system through information protection, intrusion/attack detection and effect isolation, and incident response to restore information and system security.

2.4.7.3.1.2 Provide Communications Security: GFS shall have the capability and capacity to protect communication systems from exploitation, disruption, or destruction is of highest priority.

2.4.7.3.2 Computer Network Defense (CND): Actions taken to protect, monitor, analyze, detect, and respond to unauthorized activity within Department of Defense information systems and computer networks. CND also involves the employment of intelligence,

counterintelligence, law enforcement and other military capabilities to defend Department of Defense information and computer networks.

2.4.7.3.2.1 **Sustainable:** GFS shall have the capability and capacity to provide continuous support during any type and length of operation. This requires economical design and employment of the communications system without sacrificing operational capability or survivability.

2.4.7.3.2.2 **Shared:** GFS shall have the capability and capacity to allow for the mutual use of information services or capabilities between operational area entities. This ability may cross functional or organizational boundaries.

CG: A grade of 100% is based on the ability of a CG to establish, maintain, and employ appropriate communication security measures that protect the physical communication spaces and equipment, personnel, and daily operations of the platform.

LPD-17: A grade of 100% is based on the ability of a LPD-17 to establish, maintain, and employ appropriate communication security measures that protect the physical communication spaces and equipment, personnel, and daily operations of the platform.

HSV: A grade of 100% is based on the ability of a HSV to establish, maintain, and employ appropriate communication security measures that protect the physical communication spaces and equipment, personnel, and daily operations of the platform.

AS: A grade of 100% is based on the ability of an AS to establish, maintain, and employ appropriate communication security measures that protect the physical

communication spaces and equipment, personnel, and daily operations of the platform.

LHD/FFG: A grade of 100% is based on the ability of the LHD and the FFG to establish, maintain, and employ appropriate communication security measures that protect the physical communication spaces and equipment, personnel, and daily operations of these platforms. Pairing the FFG with the LHD provides no real benefit with regard to these communication security requirements.

HSV/RORO: A grade of 100% is based on the ability of a HSV and the MPF(E) to establish, maintain, and employ appropriate communication security measures that protect the physical communication spaces and equipment, personnel, and daily operations of these platforms. Pairing the HSV with the MPF(E) provides no real benefit with regard to these communication security requirements.

Attribute Summary: All of the platforms, both individually and as paired, were capable of meeting the security requirements of this attribute based on existing doctrinal, personnel, and physical Department of Defense or Department of the Navy communication security certifications, qualifications, or mandates.

c. Platform Performance Calculations

Figure 62 details the results that we tabulated for the HA/DR mission with Excel. The results are broken down by function and then further broken down by attributes. Each platform was scored and then the value score was calculated using the weights that were given.

C	D	E	F	G	H	I	J	K	L	M	N	O
							CG	LPD-17	AS	HSV	LHD/FFG	HSV/RoRo
	Scenario Weight	Scenario Weight (%)	Local Weight	Local Weight (%)		Global Weight						
2.0 HUMANITARIAN ASSISTANCE/DISASTER RELIEF												
2.1 INFRASTRUCTURE	6	0.25										
2.1.1 Resource Network			4	0.36		0.09	80%	85%	75%	90%	95%	90%
2.1.2 Physical Network			7	0.64		0.16	40%	85%	60%	90%	95%	95%
Total Value Score							55%	85%	65%	90%	95%	93%
Total Scenario Value Score							14%	21%	16%	23%	24%	23%
2.2 MEDICAL ASSISTANCE	5	0.21										
2.2.1 Health Services			6	0.33		0.07	30%	75%	80%	30%	90%	30%
2.2.2 Plans and Operations			5	0.28		0.06	10%	80%	80%	10%	90%	10%
2.2.3 Medical Logistics			6	0.33		0.07	15%	70%	65%	30%	85%	50%
2.2.4 Administrative Services			1	0.06		0.01	100%	100%	100%	100%	100%	100%
Total Value Score							23%	76%	76%	28%	89%	35%
Total Scenario Value Score							5%	16%	16%	6%	19%	7%
2.3 LOGISTICS	6	0.25										
2.3.1 SUPPLY			6	0.22		0.06	30%	90%	95%	85%	90%	100%
2.3.2 MAINTENANCE			4	0.15		0.04	85%	85%	95%	85%	90%	95%
2.3.3 TRANSPORTATION			8	0.30		0.07	30%	85%	85%	85%	90%	95%
2.3.4 CIVIL ENGINEERING			4	0.15		0.04	40%	85%	60%	90%	95%	95%
2.3.5 OTHER SERVICES			5	0.19		0.05	80%	80%	90%	85%	80%	85%
Total Value Score							49%	85%	86%	86%	89%	94%
Total Scenario Value Score							12%	21%	21%	21%	22%	24%
2.4 COMMUNICATIONS	7	0.29										
2.4.1 Access Services			9	0.18		0.05	100%	100%	75%	100%	100%	100%
2.4.2 Voice Services			7	0.14		0.04	100%	100%	80%	100%	100%	100%
2.4.3 Data Services			7	0.14		0.04	100%	100%	80%	100%	100%	100%
2.4.4 Applications			7	0.14		0.04	100%	100%	100%	100%	100%	100%
2.4.5 Video Services			6	0.12		0.04	100%	100%	30%	100%	100%	100%
2.4.6 Satellite Communication Services			8	0.16		0.05	90%	85%	45%	80%	100%	80%
2.4.7 Communication Security			5	0.10		0.03	100%	100%	100%	100%	100%	100%
Total Value Score							98%	98%	72%	97%	100%	97%
Total Scenario Value Score							29%	28%	21%	28%	29%	28%
						1.00	59%	87%	75%	78%	94%	82%

Figure 62: HA/DR Total Value Calculations and Results

3. Summary

Incorporating our scenario-based weighting into each platform's attribute score gave us a total weighted score for each system alternative. The following list denotes the outcomes of current capability platforms and their ability, shown in terms of a percentage out of 100, to carry out the HA/DR mission in the previously described scenario:

	CG	LPD-17	AS	HSV	LHD/FFG	HSV/RORO
Overall Performance	**59%**	**87%**	**75%**	**78%**	**94%**	**82%**

Figure 63: Platform Alternatives Results for HA/DR

Per Figure 63, the following is the ranking of the platforms for performance of the HA/DR mission:

1. LHD/FFG
2. LPD-17

3. HSV/RORO
4. HSV
5. AS
6. CG

For the HA/DR mission, the most important function was communications, followed by the logistics and infrastructure components (the Logistic and Infrastructure functions have some the same characteristics). The LHD/FFG combination scored higher than other alternatives because the LHD has a strong communication suite and are thus able to provide adequate command and control support for HA/DR operations. The LHD has sufficient cargo space to carry the necessary HA/DR supplies and equipment, in addition to possessing the embarked assets to transport those supplies ashore. The FFG adds to the HA/DR mission by bringing some command-and-control capability, as well as additional assets to support transportation requirements.

E. INTERAGENCY & NGO COORDINATION

1. Scenario Overview

The purpose of this scenario was to provide a realistic context by which to evaluate GFS system alternatives within the specific mission area of utilizing NGO support. The scope of the scenario was limited to "testing" GFS-only capabilities. We accomplished this by using the scenario to determine relative importance of GFS attributes (weighting) and developing critical measures of effectiveness, thereby effectively evaluating overall system performance each alternative in this mission of NGO & Interagency Coordination.

We focused our scenario on healthcare, specifically the HIV/AIDS epidemic endemic to the population of West Africa. Our reasons for selecting this scenario were twofold: the availability of data relative to other NGO & Interagency related issues, and its pertinence to regional stability. Information pertaining to the HIV/AIDS issue was more readily available and credible than we discovered with other needs of the region. For example, AIDS rates are easier to identify and measure than the effects on human

populations by the erosion of lands caused by poor management of the forest industry. In addition, the HIV/AIDS prevalence rate remains a direct threat to regional stability: One article cites "the growing number of orphans left by HIV/AIDS, who could gravitate toward criminal activities and accelerate destabilization in the region."[159]

In addition, we chose a logistically challenging scenario, understanding that in the current state of relations between military and civilian agencies, several of their shared endeavors fail to achieve coordination beyond the transportation and supply of those agencies. With this in mind, we presented an extreme case of logistical support for three NGO detachments, semi-equally separated throughout the entire Gulf of Guinea region, with one each in Liberia, Cameroon, and Angola. Though we intended the geographic spacing to push the logistics envelope, this decision did not add an artificial element to our scenario: all three countries possess AIDS epidemics, with Cameroon accounting for one of the highest in the region (see Appendix A).

Our scenario presented a plausible method in measuring the value of each asset's performance of each attribute. Scoring the vessels' values against attributes within each mid-level mission, we had to consider what impact the scenario had on those missions in order to understand their impacts on the value scoring within each attribute. In essence, we factored in the importance of our attributes not by applying the scenario directly to them, but to their parent mid-level missions, and then weighting those missions to factor into our total value score for each platform alternative.

a. Scenario Context

The scenario is projected through the year 2012 and is portrayed as follows: The GFS is commencing her maiden deployment to the Gulf of Guinea Area of Operations (AO). She is intending to conduct multinational exercises with partner nations in the region. One of the primary mission areas of GFS, Interagency/NGO integration, is being conducted by a NGO, Project Hope. GFS is supporting Project Hope

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159. Booz Allen Hamilton, *The Greater Gulf of Guinea Simulation: Maintaining Sufficient Stability to Enhance Economic Viability* (Washington, DC: BAH, 2006).

in combating the HIV/AIDS epidemic through prevention, care, treatment, and support in three countries; Liberia, Cameroon, Angola. GFS' unique capabilities enable her to deliver, house, and support Project Hope in their mission.

b. Key Assumptions

The following assumptions were made, and would impact how our scenario evolved, and how it would impact the scores of each of the GFS alternatives within it:

- The governments of Liberia, Cameroon, and Angola are accepting GFS and NGO support; therefore, no restriction of port usage or movement exists through their waters.
- There is no direct threat to the security and safety of NGO personnel and equipment during their initial deployment in each country.
- Each NGO detachment to each country has the same number of personnel (50) and equipment in conducting their mission.
- GFS will not provide security to personnel associated to the NGO while ashore.
- Only supporting NGOs that is inherent to GFS, not others that maybe working in the region. GFS will only provide minimal support ashore to each detachment.
- If using a helicopter or LCAC asset, the vessel utilizing these assets will be 3 nautical miles offshore.
- The duration of logistical support to the NGO is 6-months.
- Because of the amount of cargo/vehicles that a NGO wants or usually takes with them to the desired country, an LHD's capability for cargo/vehicle space is considered the maximum allowed.
- NGO personnel and their equipment will be on-loaded in Rota, Spain.
- Once the NGO personnel and equipment are delivered to their respective country, they will be self sufficient in fulfilling their own logistical needs to conduct their mission.

- GFS will only provide the initial and final transportation of personnel, equipment, and supplies.

c. NGO Phases of Operation Applied to Scenario Context

Some NGOs, such as Project Hope, describe their missions in terms of phases. These phases include such elements as planning, organization, and methods of administering aid once ashore.

1) Solicitation/Planning for NGO Involvement (Phase 1): Project Hope proposes the need for a 5-year plan with 18-month, 12-month, 6-month, 3- month and 30 day preplanning meetings prior to execution of the agreed mission. Countries, training themes, mission elements should be laid out 12-18 months ahead of time in order to allow planners to flesh out details, build teams, gather equipment, tools, etc. Each country needs a detailed pre-deployment situation assessment 12-18 months out to determine exactly what the customer (Host Country) wants. Addressing the needs - and to what extent that can be accomplished - are based on what the Department of Defense and NGO(s) can provide. In our case, our platform alternative is what the Navy would provide; in the case of the NGOs, they would provide a Capacity Building Team (CBT).

Education about the epidemic takes “center stage,” and is provided by one type of CBT – a Health Professional Education team - to address the needs of physician, nurse, ancillary health workers, local health clinics, health officials on prevention, treatment. In addition, they provide health education materials to educate indigenous population, mothers, teens, fathers, and village elders.

For a short-term visit to Gulf of Guinea (6 months), Project Hope can be expected to provide the following services:

- HIV and AIDs nursing educators (educated in contraception, disease, prevention)
- Infectious disease physicians
- Infectious disease nurses
- HIV/AIDS counselor trainer

- Rapid ELISA tests for HIV detection
- Universal precaution kits, gloves, sharps containers, laminated “how to” signage for kits
- Contraceptive devices, condoms

Such methods to addressing the HIV/AIDS epidemics in Liberia, Cameroon and Angola would obviously impact scoring criteria within our attributes.

2) Transportation/Sea Basing of NGO (Phase II): The requirements for equipment/supplies needed for the CBTs have been previously identified and assembled at the port of embarkation, Rota, Spain. The platforms of consideration would on-load the necessary equipment/supplies; limited to the ship’s physical capacity or the pre-determined amount of equipment/supplies. The three Project Hope CBTs will embark the vessel and sail to their respective mission areas. Once all equipment/supplies are loaded, the platform will deploy.

3) Deployment of NGO (Phase III): The ports of Monrovia, Liberia; Douala, Cameroon; and Luanda, Angola will be used to off-load all equipment and supplies for the CBT. After the initial setup for Project Hope’s CBT, minimal GFS personnel will be on hand for the facilitation of communication between GFS and Project Hope personnel.

4) Withdrawal of NGO (Phase IV): Withdrawal is undertaken when Project Hope has deemed its mission accomplished or commencement of hostile action is imminent which threatens the livelihood of NGO/GFS personnel. Should Project Hope’s mission extend beyond 6-months, the Combat Commander will assume responsibility of the CBT. GFS/Project Hope personnel will de-erect all structures that were built; goal is to leave the place of interest as the day Project Hope arrived. All equipment/supplies will be loaded in their respective ports. Should hostile action arise in an accelerated or unexpected manner, at the very minimum, the evacuation of personnel will be the only priority via an air asset. The platform will transport Project Hope’s

personnel and equipment back to the port of embarkation, Rota, Spain. Once unloaded, the mission will be complete.

d. Scenario Characteristics

To identify a gap, we had to quantify current capability in terms of what we wanted to measure, as well as quantify what the NGOs demanded of our ship alternatives. The current capabilities are summarized in the following paragraphs, calculations and figures.

Port Information:

Monrovia; Draft: 30ft at berth[160]

Douala; Draft: 27.88ft at berth[161]

Luanda; Draft: 31ft at berth[162]

Asset Capabilities/Aviation/Amphibious Complement:

RORO Container: Cargo Ship (AKR); 1st LT Harry L. Martin[163]

Speed, knots: 18	Complement: 23 plus 100 marines
Range, n miles: 17,000 at 17kts	Draft: 36.1
Dimensions, feet: 754.3 x 106	Cargo Capacity: 168,547sq ft. Vehicle 735 TEU

CG Ticonderoga Class [164]

Speed, knots: 30+	Complement: 358
Range, n miles: 6,000 at 20 kt	Draft: 33 ft

160. OT Africa Line, “Liberia,” http://www.otal.com/liberia/index.htm.

161. OT Africa Line, “Cameroon,” http://www.otal.com/cameroon/index.htm.

162. OT Africa Line, “Angola,” http://www.otal.com/angola/index.htm.

163. Stephen Saunders, ed., *Jane’s Fighting Ships 2006-2007* (UK: Cambridge University Press, 2007), 916.

164. Stephen Saunders, ed., *Jane’s Fighting Ships 2006-2007* (UK: Cambridge University Press, 2007), 877.

Dimensions, feet: 567 x 55 — Cargo Capacity: None

LPD San Antonio Class[165]

Speed, knots: 22 — Complement: 360 plus 24 spare

Range, n miles: — Draft: 23 ft

Dimensions, feet: 683.7 x 104.7 — Cargo Capacity: 24,000 sq ft; vehicles

34,000 cu ft, cargo

Lift: 720-800 troops

LHD Wasp Class[166]

Speed, knots: 22 — Complement: 1,123

Range, n miles: 9,500 at 20 kt — Draft: 27 ft

Dimensions: 788 x 140.1 — Cargo Capacity: 20,000 sq ft vehicles

125,000 cu ft, cargo

Lift: 1,800 troops

FFG Oliver Hazard Perry Class[167]

Speed, knots: 29 — Complement: 200

Range, n miles: 4,500 at 20kt — Draft, feet: 24.5

Dimensions, feet: 453 x 45 — Cargo Capacity: None

AS Emory S Land Class: Submarine Tender[168]

Speed, knots: 20 — Complement: 1,363(AS39); 1,341(AS40)

Range, n miles: 10,000 at 12kt — Draft, feet: 28.5

Dimensions, feet: 643.8 x 85 — Cargo Capacity: None

HSV High Speed Logistics Support Vessel (Swift)[169]

165. Stephen Saunders, ed., *Jane's Fighting Ships 2006-2007* (UK: Cambridge University Press, 2007), 900.

166. Stephen Saunders, ed., *Jane's Fighting Ships 2006-2007* (UK: Cambridge University Press, 2007), 896.

167. Stephen Saunders, ed., *Jane's Fighting Ships 2006-2007* (UK: Cambridge University Press, 2007), 866.

168. Stephen Saunders, ed., *Jane's Fighting Ships 2006-2007* (UK: Cambridge University Press, 2007), 907.

169. Stephen Saunders, ed., *Jane's Fighting Ships 2006-2007* (UK: Cambridge University Press, 2007), 913.

Speed, knots: 48(light); 38(full load)	Complement: 42
Range, n miles: 2,400 at 35 kt	Draft, feet: 11 ft (FAS)
Dimensions, feet: 321.5 x 87.3	Cargo Capacity: 22,000 sq ft w/ 250 personnel 350 short tons (PP slide)

LCAC Landing Craft Air Cushion[170]

Speed, knots: 40; loaded 25	Complement: 5
Range, n miles: 300 at 35 kt	Draft, feet: 2.9
Dimensions, feet: 88 LOA x 47	Cargo Capacity: 23 troops or 60-75 tons
	Throughput, tons/hr: 307

SH-60B Seahawk[171]

Speed, knots: 145; loaded: 110	Range, n miles: 450
Cargo Capacity, tons: 3 (cargo hook) 2 (internal)	Throughput, tons/hr: 62.5

CH-46E Sea Knight[172]

Speed, knots: 137; loaded: 110	Range, n miles: 180
Cargo Capacity, tons: 1.3(net) 4.5(sling)	Throughput, tons/hr: 93.8

CH-53 E Super Stallion[173]

Speed, knots: 150; loaded: 110	Range, n miles: 480
Cargo Capacity, tons: 16	Throughput, tons/hr: 333.6

The following chart depicts each platform's capability in carrying cargo and vehicles; it also displays the ability of each platform to pull into the above-mentioned ports of the scenario, with platform draft and port depth comprising the criteria.

170. Systems Engineering Analysis Cohort 11, *Systems Engineering and Analysis Total Ship Systems Engineering (m*aster's thesis, Monterey, CA: Naval Postgraduate School, 2007), 194.

171. Systems Engineering Analysis Cohort 11, *Systems Engineering and Analysis Total Ship Systems Engineering* (master's thesis, Monterey, CA: Naval Postgraduate School, 2007), 203.

172. Stephen Saunders, ed., *Jane's Fighting Ships 2006-2007* (UK: Cambridge University Press, 2007), 890.

173. Systems Engineering Analysis Cohort 11, *Systems Engineering and Analysis Total Ship Systems Engineering* (Master's thesis, Monterey, CA: Naval Postgraduate School, 2007), 204.

Vessel Characteristics				
	Cargo Capacity (ft^3)	Vehicle Capacity (ft^2)	Draft	Pier-side Ability
CG	None	None	33	No
RO/RO	999,600	127,000	36.1	No
LPD	34,000	24,000	23	Yes
LHD	125,000	20,000	27	Yes
FFG	None	None	24.5	Yes
AS	None	None	28.5	Yes, No/Douala
HSV	14,000	22,000	11	Yes

Figure 64: Vessel Cargo Capacities

The chart below represents how much cargo/vehicle space is allotted per NGO detachment (I.E. total platform capacity divided by three).

Scenario Numbers/NGO		
	Space allotted/NGO (ft^3)	Vehicle Space/NGO (ft^2)
RO/RO	333,200	42,333
LPD	11,333	8,000
LHD	41,667	6,667
HSV	4,667	7,333

Figure 65: Space Allotted per NGO Detachment

Transit Distance:[174]

Rota, Spain to Monrovia Liberia: 2,151nm

Monrovia, Liberia to Douala, Cameroon: 1,271nm

Douala, Cameroon to Luanda, Angola: 937nm

Luanda, Angola to Rota, Spain: 3,851nm

Total Transit Distance: 8,210nm

Travel Time: Based on each platform's transit speed, the following charts indicate the total travel time and time between each port; starting and ending in Rota, Spain.

Speed		
	Max	Transit
CG	30	14
LPD	25	14
HSV	48	38
RO/RO	18	14
FFG	29	14
LHD	22	14
AS	20	12

Figure 66: Vessel Speeds

Time Distance		**Time between Ports (days)**			**Arrival Day; Transit Speed**	
CG		Max Speed	Transit Speed			
Rota	Monrovia	2.99	6.40		Monrovia	6.40
Monrovia	Douala	1.77	3.78		Douala	11.18
Doula	Luanda	1.30	2.79		Luanda	14.97
Luanda	Rota	5.35	11.46		Rota	**27.43**
LPD						
Rota	Monrovia	3.59	6.40		Monrovia	6.40

174. SeaRates.com, "Sea Rates," http://www.searates.com/container/shippingline/.

Monrovia	Douala	2.12	3.78	Douala	11.18
Doula	Luanda	1.56	2.79	Luanda	14.97
Luanda	Rota	6.42	11.46	Rota	**27.43**

HSV					
Rota	Monrovia	1.87	2.36	Monrovia	2.36
Monrovia	Douala	1.10	1.39	Douala	4.75
Doula	Luanda	0.81	1.03	Luanda	6.78
Luanda	Rota	3.34	4.22	Rota	**12.00**

RORO					
Rota	Monrovia	4.98	6.40	Monrovia	6.40
Monrovia	Douala	2.94	3.78	Douala	11.18
Doula	Luanda	2.17	2.79	Luanda	14.97
Luanda	Rota	8.91	11.46	Rota	**27.43**

FFG					
Rota	Monrovia	3.09	6.40	Monrovia	6.40
Monrovia	Douala	1.83	3.78	Douala	11.18
Doula	Luanda	1.35	2.79	Luanda	14.97
Luanda	Rota	5.53	11.46	Rota	**27.43**

LHD					
Rota	Monrovia	4.07	6.40	Monrovia	6.40
Monrovia	Douala	2.41	3.78	Douala	11.18
Doula	Luanda	1.77	2.79	Luanda	14.97
Luanda	Rota	7.29	11.46	Rota	27.43

AS					
Rota	Monrovia	4.48	7.47	Monrovia	7.47
Monrovia	Douala	2.65	4.41	Douala	12.88
Doula	Luanda	1.95	3.25	Luanda	17.14
Luanda	Rota	8.02	13.37	Rota	31.51

Figure 67: Time-Distance

e. Calculations

Throughput Rate Calculations[175]:

- **LCAC**: Based on a distance of 3 nm, the throughput of the LCAC going from the supply ship to the location of debarkation, close to the port destination is (60 tons)*(25 nm/hr)/(3 nm) = 500 tons/hr. This value does not take into account the time to load, unload, and return to the supply ship to begin a new run. Taking into account the return trip to the supply ship, the throughput is (60 tons)/[(3 nm/25 nm/hr)+(3 nm /40 nm/hr)] =**307 tons/hr.**
- **SH-60B:** External load; 3 tons, 3 tons/[3 nm/110 nm/hr)+(3 nm / 145 nm/hr)]= **62.5 tons/hr.**
- **CH-46E:** External load; 4.5 tons, 16/[3 nm/110 nm/hr)+(3 nm / 145 nm/hr)]= **93.8 tons/hr**
- **CH-53E:** External load; 16 tons, 16/[3 nm/110 nm/hr)+(3 nm / 145 nm/hr)]= **333.6 tons/hr**

The following chart depicts the results of our computations:

Helicopter/LCAC Throughput	Tons/hr
SH-60B	62
CH-46E	93
CH-53E	333
LCAC	307

Figure 68: Connector Throughput

The next chart combines the total connector throughput capabilities to each platform. We based the number of helicopters and LCACs a platform could carry on the individual platform's capability to inherently support those assets:

175. Systems Engineering Analysis Cohort 11, *Systems Engineering and Analysis Total Ship Systems Engineering* (master's thesis, Naval Postgraduate School, 2007), 195.

			Total Throughput	
			Tons/hr	
	Helicopter	LCAC	Helicopter	LCAC
CG	2-SH-60B	None	124	0
RO/RO	None	None	0	0
LPD	2 CH-46E	2-LCAC	186	614
LHD	12-CH-46E	3-LCAC	1116	921
	9-CH-53E		2997	
FFG	2-SH-60B	None	124	0
AS	None	None	0	0
HSV	1-SH-60B	None	62	0

Figure 69: Total Throughput per Platform Alternative

Cargo Calculation Assumptions:

- 1 TEU: 1,360 FT^3; 20 ft container dimensions: 20' x 8' x 8.5'[176]
- 1 Ton = 40 FT^3 [177]
- # of Vehicles a vessel can carry: 1 vehicle = size of a Chevrolet Suburban (2006) = 235.2ft^2 with 2ft of space added to each side of vehicle.[178]

Based upon the above calculations, the chart below summarizes each platforms ability to carry cargo in tons and number of vehicles (Chevrolet Surburban size 2006 GMT800)

Conversion to Tons and Vehicles(Total each platform can carry)		
	Cargo(Tons)	Vehicle
RO/RO	24,990	179
LPD	850	34
LHD	3,125	28
HSV	350	31
HSV/RO-RO	25,340	210

Figure 70: NGO Tonnage Conversions

[176] Emase, [cited September, 2007]; http://www.emase.co.uk/data/cont.html

[177] Sizes, [cited September, 2007]; Available from http: //www.sizes.com/units/ton.htm

[178] Wikipedia, [cited September, 2007]; http://en.wikipedia.org/wiki/Chevy_Suburban

NGO "Success" Metrics:

Project Hope has its own measure of success metrics. They follow:

- Safe return of all volunteers (VOLS)
- Conduct of mission within budget
- No accidents or serious injury of VOLS

Other measures of success could not be determined from our contact with Project Hope.

f. Desired End-State

It is hoped the efforts of Project Hope, via GFS, enhances health of the population by reducing the HIV/AIDS prevalence rate, which in turn will foster increased stability to the host country.

2. Weighting and Grading of NGO & Interagency Coordination Attributes

a. Overview of Approach

For the Inter-Agency / NGO Coordination mission, the scenario influenced our grading of ship performance. The attributes which supported the mid level missions were each given an "attribute weight," which attempted to give a value of the relative importance of each attribute (attribute weight) within the mid-level mission it supported. Scenario impact on our attributes was factored via the mid-level functions themselves, with weights assigned to each mid-level mission (scenario weight) according to their importance in the scenario. For example, the 2nd Embassy mission was weighted low, as our HIV/AIDS scenario did not demand that an embassy be relocated. Each platform alternative (ship or combination of ships) was then graded (scored) based on its ability to fulfill the criteria of each attribute, with the weights and scores within each attribute, and for each ship, culminating in a total value score derived out of the supported mid-level missions and their scenario weights.

b. Attribute Outcomes

The following is an evaluation of each of the attributes and their weights, which ultimately lead to determining the best ship alternative for accomplishing this mission.

3.1 2nd Embassy: The ability to provide the means for State Department, and other governmental and non governmental agencies inherent to GFS to conduct administrative and diplomatic aspects of their missions in addition to serving as actual U.S. Embassy in case of an emergency evacuation of land based embassy.

Scenario Weight: 2

By having the ability to act as a 2nd Embassy, the platform(s) will have the ability to act in accordance with the inter-agency and NGO coordination goals emphasized in our strategic guidance. We recognized the importance of this, but the coordination aspect of this function was considered a relatively low priority simply due to the fact that coordination between NGOs, State Department, and the military *at sea* still remains in a state of infancy, and our project (as stated earlier in the FAA), simply did not find the resources available to prescribe improvements to interagency coordination aboard ship. Regarding the need to actually function as a second embassy, we would have ranked it more highly in the event of working in an austere environment where embassies ceased to work. Such is not the case in Cameroon, Angola, or Liberia – and we elected not to add such a circumstance into our scenario. Within the realm of our scenario, this function ranks relatively low due to our scenario's focus on healthcare, and on the assumption that working embassies will exist in each country in 2012.

3.1.1 Coordination Center: GFS will have the capability of coordinating Inter-Agency/NGO efforts with DEPARTMENT OF

DEFENSE efforts. This coordination center will have the proper command and control features to facilitate communication between parties of interest; each specific to its host nation. (Make due with space available)

Attribute Weight: 5

The reason why Coordination Center is weighted a 5 is due to the fact that while it is important to have the ability and capacity to conduct coordination efforts, the frequency and sophistication of necessary equipment is not that high.

Value Score Criteria: The basis of the criteria is each alternatives communications suite and availability of spaces to conduct meetings and planning events. The scores across the board are high due to the fact that the sophistication of communication equipment is low. Although the space available for planning and meeting is low on some alternatives as compared to others, it is assumed the each platform will make do with the space available to accommodate the necessary meetings and planning events. It is often inconvenient to utilize spaces such as the mess decks and wardroom for meetings. However, necessity requires meetings to be held, those spaces would be used accordingly.

CG: Grade of 90%. Superb communications suite (SHF, EHF, TV-DTS, UHF), but lacks in the extra space needed to accommodate all the additional personnel. There only limited spaces where people can conduct meetings and planning conferences.

LPD: Grade of 95%. Superb communications suite (SHF, EHF, TV-DTS, UHF) for the tasks required, has the extra space needed to accommodate all the additional personnel, but not as much space as the LHD.

HSV: Grade of 90%. The HSV harbors the necessary communications equipment to complete the required tasks. But its communications suite is not to the level of a CG or LPD. The HSV does not have SHF capabilities, although it does have INMARSAT. Additionally, its adaptability will allow it host a number of the additional personnel required.

AS: Grade of 90%. The AS was not designed for a significant communication suite. It has the same communications equipment as the HSV. The ability of the AS to accommodate the space requirements offset the lack of a complex communication suite.

LHD/FFG: Grade of 100%. The combined communications suites in addition to the space on the LHD to accommodate the additional personnel give it the max score.

HSV/RORO: Grade of 90%. The RORO doesn't bring anything to the table when it comes to communications. It only has INMARSAT. The HSV / RORO combination will rely on the HSV's ability to communicate therefore, the combination receives the same score as the HSV alone.

3.1.2 Communicate Information: To send and receive internal and external data. This activity includes obtaining, relaying, and distributing data and information by any means including establishing communication links with service, joint, interagency, intra-agency, and coalition forces. Information can include the mission, courses of action, air-tasking orders, operational plans and orders, intelligence, environmental conditions, friendly troop/unit status and location, relaying I&W information, and other reports.

Attribute Weight: 7

Without the ability to communicate, NGO and Interagency efforts with military assets are limited to within line-of-sight, severely impacting operations ashore.

Value Score Criteria: While the focus of 3.1.1 was on the overall communications suite, this attribute graded each alternative on specifics of the communication suite, taking into account data links, and the ability to communicate more tactical information.

CG: Grade of 100%. The CG has the communications suite capability to host all the communication needs of a DESRON staff; therefore it is fully capable to host the needs of any 2nd embassy organization or department. Additionally, it has secure EHF communications in case it is necessary to conduct secure communications. The CG's communications suite is robust enough to handle any necessary communications.

LPD: Grade of 85%. While the LPD communication suite is sufficient, it is not up to par with the CG or LHD therefore relegating it to third in the rankings. The LPD has the major communications gear SHF, UHF. However, it lacks in the tactical communications area. It does not have SINCGARS, BFEM. Therefore, the CG and LHD, which have those assets, score higher.

HSV: Grade of 80%. The HSV does not have the tactical data links (Link 11, Link 16), that the CG, FFG, LHD, LPD have. It was not designed for those tactical purposes.

AS: Grade of 75%. As a submarine tender it is not designed or equipped with the necessary tactical communication suites

LHD/FFG: Grade of 100%. The combined communications suites in addition to the space on the LHD designed to accommodate a contingency such as the kind that would be employed when acting as a 2nd embassy contribute to the grade of 100%. LHD's are frequently utilized as command centers when

operating in an ESG, therefore the capability of being used as a 2nd embassy is not far strung.

HSV/RORO: Grade of 80%. The HSV does not have the tactical data links (Link 11, Link 16), that the CG, FFG, LHD have. The RORO brings nothing to the table, in terms of communications.

3.2 Storage of US Agency/NGO equipment: The ability to transport the equipment and supplies necessary to conduct the stated mission from the point of on load to the final destination.

Scenario Weight: 9

3.2.1 Storage: GFS will have adequate space and secure storage facilities onboard a ship or shore for the purposes of transporting cargo.

Attribute Weight: 10

The primary mission of the GFS in this scenario is to carry supplies to the region in support of the NGOs; therefore, the ability to store cargo is weighted a 10 (the highest score allowable).

Value Score Criteria: The criteria for measuring storage was the capacity for each alternative to store cargo. Cargo is broken down into two categories: Vehicles and Non-Vehicles (called cargo). Both the ability to carry vehicles and carry cargo was weighted differently. We thought it was more important to carry cargo than it was to carry vehicles. Space for vehicles is measured in square feet, and space for cargo is measured in cubic feet. The scores are based off the amount of space of each alternative compared the amount of space on the alternative with the largest capacity for carrying either vehicles (LHD) or cargo (LPD). The amount of space available on the RORO was considered excessive.

Therefore, the space available on the LHD (for cargo) and LPD (for vehicles) provided the same utility and gave us a more reasonable capacity number to base our alternatives.

CG: **Grade of 0%.** The CG has negligible capacity to carry any cargo (vehicles or general cargo). In our study we allotted the CG two helicopters, therefore eliminating any cargo capacity that would have existed by utilizing the helicopter hangers.

LPD: Grade of 53%. With a vehicle capacity of 24,000 ft^3 it has the largest amount of space for vehicles. But, its capacity to carry cargo is significantly less than that of an LHD.

HSV: Grade of 40%. The HSV performs well in capacity to carry vehicles with 22,000 ft^2 of deck space, compared to the LPD's 24,000ft^2. However, just as the LPD falls short in the cargo capacity element, so does the HSV.

AS: Grade of 30%. Of all the alternatives (CG excluded) the AS scores the least because of its inability to carry vehicles at all.

LHD/FFG: Grade of 100%. Although the LHD does not have the largest capacity of the alternatives, it has the same utility of the largest capacity. Therefore, the LHD/FFG combination received the score of 100%

HSV/RORO: Grade of 100%. By far it has the most cargo capacity of the alternatives, with the capacities of nearly 1,000,000 ft^3 of space for cargo and 127,000 ft^2 for vehicles.

3.3 Sustaining US Agency/NGO personnel: The ability to support the embarked personnel with adequate quality of life necessities while underway to their ultimate destination.

Scenario Weight: 5

Although the GFS' mission is to support NGOs, we decided it was more important to have the ability to store and transport cargo, than to sustain

personnel. Supporting personnel received a weight of 5 for that reason. It is important but not mission critical. Sustaining personnel was broken down into two categories Messing and Berthing. Each was weighted the same.

3.3.1 Messing: GFS will have the capability to provide messing to the involved personnel onboard a ship/platform or shore facility. This includes the capability to properly store, prepare, distribute, and dispose food and liquid.

Attribute Weight: 7

Personnel require sustenance to function.

Value Score Criteria: The criteria used to determine the score for each alternative was the inherent ability of each asset to feed the additional personnel without affecting the needs of the crew. This seems trivial as all alternatives should be able to feed everyone on board. However, the HSV has special needs that have to be taken into account when adding additional riders.

CG: Grade of 100%. The asset has to the ability to feed all additional NGO personnel onboard.

LPD: Grade of 100%. . The asset has to the ability to feed all additional NGO personnel onboard.

HSV: Grade of 100%. The asset has to the ability to feed all additional NGO personnel onboard. However, the HSV can only supply 100 passengers A-rations for 10 days. In the context of the scenario, the passengers will not be embarked in excess of ten days. Therefore, the 10-day A-ration limitation will not be reached.

AS: Grade of 100%. The asset has to the ability to feed all additional NGO personnel onboard.

LHD/FFG: Grade of 100%. The asset has to the ability to feed all additional NGO personnel onboard.

HSV/RORO: Grade of 100%. The asset has to the ability to feed all additional NGO personnel onboard.

3.3.2 Berthing: This includes the needed facilities for rest, sleep, and sanitation.

Attribute Weight: 7

Berthing received an attribute weight of 7 because, while it is important to have the ability to carry personnel to the region, the mission would not fail if only supplies were brought via GFS, with the personnel airlifted into theater.

Value Score Criteria: We scored the ships based the ability of the platform or combination of platforms to berth the 150 people in our scenario. If the alternative could not accommodate all 150 people, the platform was graded on the percentage of 150 people it could carry.

CG: Grade of 10%. The CG is not designed to carry very many additional passengers. Therefore, we assumed the most riders the CG could carry (without leaving crew members behind) was 15. 15 is 10% of 150.

LPD: Grade of 100%. With the ability to house nearly 800 Marines, the LPD was easily able to house our 150 people.

HSV: Grade of 50%. The HSV has the capacity to carry 75 passengers in temporary racks.

AS: Grade of 75%. The AS has the capacity to carry an additional 100 passengers.

LHD/FFG: Grade of 100%. Just as the LPD has the capacity to house Marines, so does the LHD. The LHD's ability to

accommodate over 1,000 Marines makes up for the fact that the FFG only has the ability to house about 10-15 personnel.

HSV/RORO: Grade of 100%. While the HSV can only accommodate an additional 75 passengers, the RORO has the ability to house 100 persons.

3.4 Logistic support for US Agency/NGO personnel and equipment: The ability to provide the necessary support in order to establish and sustain operations for NGOs that are based ashore.

Scenario Weight: 10

The fundamental purpose of utilizing GFS for Interagencies and NGOs is transporting personnel, equipment, and supplies to the designated country. Many Gulf of Guinea nations do not possess a robust transportation infrastructure. By affording the capability to on-load, transport, and off-load equipment, personnel and supplies to virtually any country in the Gulf of Guinea region, allows NGOs that could not previously conduct their missions due to traditional transportation constraints in a logistical barren region. It also allows the NGO the potential to bring more supplies, personnel, and equipment to the region since many of the analyzed vessels have the capacity to carry an enormous amount of cargo or vehicles compared to traditional means of transporting goods to the Gulf of Guinea region.

3.4.1 Transportation: To distribute logistics support in the form of material support services by employing transportation services. Also GFS needs to move material or personnel by carrier via small boat, or aircraft when available. This task includes technical operations, moving, and evacuation of cargo, personnel, and equipment. At aerial and seaports of debarkation, responsibilities

of transportation support include off-load, operational control of beaches and management of the throughput.

Attribute Weight: 10

Safe, reliable, and ample cargo/vehicle capacity: affording this capability to any potential NGO would be a great asset for them to utilize in conducting their mission. This is especially critical in regions where the NGOs cannot conduct their mission due to logistical constraints that are inherent in my developing nations. By allowing the capability to transport cargo to any ocean bordering nation, gives NGOs a greater reach to conduct their mission.

3.4.1.1 Conduct LCAC Operations: GFS will have the capability to operate LCACs to include the launch, recovery, loading, and unloading of LCACs from the GFS to shore.

Sub-Attribute Weight: 5

If a vessel cannot physically pull into port due to draft constraints, poor harbor infrastructure or other harbor restrictions due to man or nature; the next optimal method to off-load/on-load cargo/personnel is utilizing an LCAC. LCACs have the capability to off-load/on-load great amount of cargo/personnel without going pier-side or the need to have a port.

Value Scoring Criteria: Number of LCACs each carry. Since the LHD can carry the most number of LCACs, all other vessels were graded against the LHD. Of the vessels that could carry cargo, all of them could pull into port; no need to use LCAC assets to on-load/off-load cargo. The vessels that could not carry cargo, this attribute does not apply to them either.

All Vessels: Grade of N/A.

3.4.1.2 Provide Vertical Replenishment: To conduct vertical replenishment in support of operating forces by providing refrigerated stores, dry provisions, spares, general stores, fleet freight, mail, personnel, and other items.

Sub-Attribute Weight: 3

This is the least desirable method of off-loading/on-loading cargo. Helicopter assets have the lowest cargo carrying capability in tonnage. Cargo must also be configured to allow helicopters to carry the cargo thus adding another logistical constraint. Yet, helicopters allow the ability to off-load/on-load cargo and personnel should a vessel not be able to go pier-side or if there is a need to go inshore that is beyond the capability of a LCAC.

Value Scoring Criteria: If a vessel does not have LCAC or cannot off-load/on-load cargo at the pier, using a helicopter is the last viable option.

Since most of the vessels can off-load their own cargo in port, this particular attribute was N/A except;

CG: Grade of 50%. The CG is only capable of transporting personnel. With the exception of very limited external load capability on the SH-60, the CG has no inherent cargo carrying capacity. Should there be any personnel to drop-off/pick-up, the CG would use a helicopter.

HSV/RORO: **Grade of 40%**. The amount of cargo the helicopter is transferring is based upon the

amount an LHD can carry and subtracting that amount from what the HSV can carry. 1,041 tons - 116 tons = 925 tons. This tonnage is carried on the RORO. We then can determine cargo-carrying throughput of the helicopter and take that into account of 6 useful hours the helicopter is available per day. 925 tons/ 62 tons/hr = 14.92 hrs; time it took for the one helicopter to carry the cargo. 6/14.92 is 40%. Another assumption is the ship that goes pier-side takes a maximum of 1 day to off-load/on-load cargo.

3.4.1.3 Provide In-port Replenishment: To conduct replenishment in-port in support of operating forces by providing refrigerated stores, dry provisions, repair/spare parts, general stores, fleet freight, mail, personnel, and other items.

Sub-Attribute Weight: 7

Off-loading/loading cargo and equipment pier-side is the best way to facilitate the movement off cargo off/on a vessel. Moving cargo by the vessel's inherent or port's cranes and moving vehicles on/off ship by a ramp is much more efficient than utilizing LCAC or helicopter assets.

Value Scoring Criteria: If the vessel can pull into all three ports, that vessel scored 100%.

CG: Grade of N/A; CG does not have any cargo to off-load/on-load. Therefore, there is no necessity to go pier-side.

HSV: Grade of 100%; HSV can go pier-side in all three ports.

LPD: Grade of 100%; LPD can go pier-side in all three ports.

AS: Grade of 67%; AS can go pier-side 2 of 3 ports.

LHD/FFG: Grade of 100%; LHD/FFG both can go pier-side in all three ports.

HSV/RORO: Grade of 100%; RORO cannot go pier-side into any of the three ports, but the HSV can go into all three ports. Any cargo from the RORO must be transferred by a helicopter to either the HSV or final unloading destination.

3.5 Minimize Militaristic Perception: The ability of GFS to minimize the public perception of a military intrusion of their nation's sovereignty, or perception of a use of force. In some cases, remaining off the coast – vice entering port - may provide the best alternative to achieving this end. In others, where a brief visit into port by GFS proves more efficient for the mission or is simply desired by the host-government, measures exist to minimize the inherent perception affiliated with ship presence: 1) avoid intimidating force postures, and 2) mitigate a military appearance. The reduction of military equipment and weapons while operating ashore should be achieved to the maximum extent possible. Social and political sensitivity of the region, as well as the non-militaristic nature of several partnering NGOs and IOs, dictate this attribute.

Scenario Weight: 5

Minimizing militaristic perception is based largely on a characteristic mentioned in our Strategic Guidance, and described by Naval Forces Europe as the desired result of an attribute of their APS: minimizing

footprint ashore.[179] Suspicion about the use of military assets for GFS by potential host-countries remains a large hurdle to coordinating interactions with them. By fulfilling this attribute, we hope to influence expanded partnerships with non-military agencies and organizations, and to improve West African nations' willingness to interact with GFS in cooperative engagements.

3.5.1 Force Posture: GFS will have the capability to change and adapt force-presence posture to host country culture and sensitivities, as well as facilitate a proper inter-agency/NGO working climate.

Attribute Weight: 2

Force-posture aboard a platform is transparent unless an observer is within very-close proximity.

Value Scoring Criteria: Equally weighted criteria of 1) No visible (topside) appearance of armed sentries, and 2) Ability of platform to avoid force protection drills topside. A deficiency in either of these would result in a score of -.5 for that particular criteria, whereas met criteria would result in a score of +.5. The total score achievable (both criteria met), is 1.0 (or 100%).

CG: Grade of 50% due to inability to avoid armed sentry presence (-.5), and ability to avoid topside drills while in port (+.5).

LPD: Grade of 50% due to inability to avoid armed sentry presence (-.5), and ability to avoid topside drills while in port (+.5).

HSV: Grade of 50% due to inability to avoid armed sentry presence (-.5), and ability to avoid topside drills while in port (+.5).

179. Africa Partnership Station, "Africa Partnership Station: An Initiative to Promote Maritime Safety and Security," Naval Forces Europe and U.S. Sixth Fleet, http://www.c6f.navy.mil/APS/About/.

AS: Grade of 50% due to inability to avoid armed sentry presence (-.5), and ability to avoid topside drills while in port (+.5).

LHD/FFG: Grade of 50% due to inability to avoid armed sentry presence (-.5), and ability to avoid topside drills while in port (+.5).

HSV/RORO: Grade of 50% due to inability to avoid armed sentry presence (-.5), and ability to avoid topside drills while in port (+.5).

3.5.2 Military Appearance: GFS shall avoid the physical appearance of a military platform.

Attribute Weight: 6

Ship alternatives may form a visual impression to observers at greater distances, thereby influencing the impressions of a port city's entire population (vice an individual observer on a pier).

Value Scoring Criteria: Equally weighted criteria of 1) Grey Hull Color (HC) (Grey = 0, Non-Grey = 1), 2) Visual Presence of Large Weapons (LW) (LW = 0, No LW = 1), and 3) Warship Shape (SH) (SH = 0, Non-SH = 1). For SH, Talbot-Booth classifications of B2 bows (curved and raking, or sharp rakes) *and* heavy "military" masts, were used to determine what comprised a warship shape. In cases where ship platforms could not enter port due to draft limitations, connector platforms (LCAC, SH-60) were graded in their place using the same criteria, but with the following modifications: HC became Grey Hull/Fuselage color, WS comprised of "any shape which might be readily correlated with a military platform," and a factor of 5/6 was applied to the overall value score on account of their smaller size.

CG: Grade of 28% based on SH-60 connector sent into port in lieu of CG due to draft restrictions; grey fuselage color (HC = 0), no large weapons (LW = 1), readily identifiable military helicopter shape (SH = 0); factor of 5/6 applied due to small size.

LPD: Grade of 33% due to grey hull (HC = 0), no large weapons (LW = 1), and raked bow and heavy mast (SH = 0).

HSV: Grade of 66% due to grey hull (HC = 0), no large weapons (LW = 1), and raked bow *but no* heavy mast (SH = 1).

AS: Grade of 66% due to grey hull (HC = 0), no large weapons.(LW = 1), and no raked bow and no heavy mast (SH = 1).

LHD/FFG: Grade of 17% due to grey hulls of both, warship shapes of both, and large weapons on the FFG but not on the LHD.

HSV/RORO: Grade of 66% based on HSV sent into port in lieu of RORO due to draft restrictions. Of note, the RORO scored a 100% due to black hull, no topside weapons, and lack of a heavy mast, but was unable to enter two of the three ports in our scenario.

Attribute Summary: We considered this attribute important due to its impact in fostering a cooperative spirit with West African nations and with NGOs, by calming their suspicions about GFS having militaristic motives. Out of our "current capability" assets, it was no surprise to us that the traditional grey-hull response to shaping and stability operations – namely, an ESG component represented by our LHD/FFG alternative – achieved a low score in its ability to minimize its "footprint" in port. The greatest surprise was the impact of our scenario on the score of the RORO/HSV package: though the RORO seemed the epitome of this attribute due to its commercial (non-military) appearance (score of 100%), this strength had to be neglected as a scoring factor due to its inability to enter port in our scenario.

c. *Platform Performance Calculations*

The chart below summarizes our analysis on how each platform fared for each attribute for the NGO scenario.

	Scenario Weight	Weight	Weight	Global Weight	CG	HSV	LPD	AS	LHD/FFG	HSV/RORO
3.0 Inter-Agency / NGO Coordination										
3.1 2nd Embassy:	2									
3.1.1 Coordination Center:		5		0.03	90%	90%	95%	90%	100%	90%
3.1.2 Communicate Information:		7		0.04	100%	80%	85%	75%	100%	80%
Total Value Score					96%	84%	89%	77%	100%	84%
Total Scenario Value					6%	5%	6%	5%	6%	5%
3.2 Storage of US Agency/NGO equipment:	9									
3.2.1 Storage:		10			0%	40%	53%	19%	94%	100%
3.2.1.1 Cargo:			9	0.19	0%	11%	27%	30%	100%	100%
3.2.1.2 Vehicles:			5	0.10	0%	92%	100%	0%	83%	100%
Total Value Score					0%	40%	53%	19%	94%	100%
Total Scenario Value					0%	12%	15%	6%	27%	29%
3.3 Sustaining US Agency/NGO personnel (150):	5									
3.3.1 Messing:		10		0.09	100%	100%	100%	100%	100%	100%
3.3.2 Berthing:		7		0.07	10%	50%	100%	75%	100%	100%
Total Value Score					63%	79%	100%	90%	100%	100%
Total Scenario Value					10%	13%	16%	14%	16%	16%
3.4 Logistic support for US Agency/NGO personnel	10									
3.4.1 Transportation:		10			50%	100%	100%	67%	100%	82%
3.4.1.1 Conduct LCAC Operations:			5	0.11	N/A	N/A	N/A	N/A	N/A	N/A
3.4.1.2 Provide Vertical Replenishment:			3	0.06	50%	N/A	N/A	N/A	N/A	40%
3.4.1.3 Provide In-port Replenishment:			7	0.15	N/A	100%	100%	67%	100%	100%
Total Value Score					50%	100%	100%	67%	100%	82%
Total Scenario Value					16%	32%	32%	22%	32%	26%
3.5 Minimize militaristic perception:	5									
3.5.1 Force Posture:		2		0.04	0%	50%	50%	50%	50%	50%
3.5.2 Appearance		6			28%	66%	33%	66%	17%	66%
3.5.2.1 Ship (Higher = less militaristic)			6	0.05	N/A	66%	33%	66%	17%	66%
3.5.2.2 Helicopter			5	0.04	28%	N/A	N/A	N/A	N/A	N/A
3.5.2.3 LCAC			5	0.04	N/A	N/A	N/A	N/A	N/A	N/A
Attribute score					28%	66%	33%	66%	17%	66%
Total Value Score					21%	62%	37%	62%	25%	62%

Total Scenario Value		3%	10%	6%	10%	4%	10%
	1.00	36%	72%	76%	57%	86%	87%

Overall		CG	HSV	LPD	AS	LHD/FFG	HSV/RORO
Performance		36%	72%	76%	57%	86%	87%

Figure 71: NGO/Interagency Total Value Calculations and Results

d. Summary of Results

Incorporating our scenario-based weighting into each platform's attribute score gave us a total weighted score (total value score) for each system alternative. The following list denotes the outcomes of current capability platforms and their ability, shown in terms of a percentage out of 100, to carry out the Inter-Agency and NGO mission in the previously described scenario:

Overall		CG	HSV	LPD	AS	LHD/FFG	HSV/RORO
Performance		35%	71%	76%	56%	86%	87%

Figure 72: Platform Alternative's Results in NGO/Interagency Mission

Listed by rank, the alternatives follow:

1) HSV/RORO
2) LHD/FFG
3) LPD
4) HSV
5) AS
6) CG

While a RORO is not usually considered a major player in standard peacetime naval deployments, the combination of a RORO with a HSV receives the highest score of any of the alternatives for this particular scenario. The large cargo capability of the RORO, combined with the transporting characteristics of the HSV, ultimately gave it the highest score. The inclusion of the HSV allows the combination to score well in a number of categorizes that the RORO alone would not have.

Interestingly, the RORO / HSV combination is similar in nature to a GFS concept ship currently in the early stages of investigation by NAVSEA.[180] Essentially, in order to do a NGO support mission, a GFS will need a great deal of transporting capability. Unfortunately, having that transporting ability, usually results in poor speed and maneuverability, key capabilities for doing other GFS related missions. By combining the best cargo-carrying ship in the Navy with one of the fastest ships in the Navy, the combination ranks highest in this capabilities based assessment.

180. Mark Campbell, conversation with SEA-12 regarding NAVSEA RORO/HSV combination, November 5, 2007.

F. GROUP OUTCOME: THE "BEST" ALTERNATIVES

1. Bringing our FNA Results Together

Combining the total value scores of each mission team's FNA studies resulted in the following matrix:

	PE	HA/DR	NGO/Interagency
CG	0.97	0.59	0.36
HSV	0.91	0.78	0.72
LPD	0.96	0.87	0.76
AS	0.72	0.75	0.57
LHD/FFG	0.97	0.94	0.86
HSV/RORO	0.85	0.82	0.87

Figure 73: FNA Platform Performance Results, per Mission

From this, cumulative scores can be quickly examined. For instance, one might note that the AS held the lowest score in two of three mission areas, or that the CG held the lowest cumulative score, thereby negating both as GFS alternatives. But this cursory glance fails to consider other factors, like the importance of conducting all mission areas, or the importance of conducting one over another, or certain risks. The CG, after all, tied for second place in Peacetime Engagement. In addition, general scoring trends – such as how most alternatives failed to achieve as high a score in an NGO/Interagency Coordination role as they did in Peacetime Engagement missions – may be gleaned from this matrix; however, cumulative scores and grading trends provide only a cursory glance at what this matrix can provide. Circumstances under which our decision needed to be made had to be considered, as well. This matrix was a starting point in determining our "best" alternative for GFS, and lead to further analysis.

2. Decision Theory Approach

Utilizing elements of decision theory, we hoped to attain more genuine answers in our quest to determine the "best" GFS alternative out of "current capability," and also to identify the true gap between that capability and our desired end-state. Indeed, our matrix could readily be called a *decision evaluation matrix*.

Blanchard and Fabrycky state that "a particular decision can result in one of several outcomes, depending on which of several future events occurs."[181] Our "decision" consisted of which platform to select as our best alternative out of "current capability," and the geo-political environment of the Gulf of Guinea in 2012 comprised our "future event." The latter variable might also be described in terms of how important each mission area would be in 2012, considering that the environment drives them.

Three decision situations may be utilized to guide a decision-maker: those made "under assumed certainty, risk, and uncertainty."[182] In our problem statement, we originally predicated our selection of the year 2012 in an effort to minimize decisions under uncertainty, realizing that the potentially volatile geo-political nature of West Africa might be impossible to predict twenty years out. This did not mean, however, that we were naïve to the fact that much can change in a country – or a region – in the space of five years. For this reason, we threw-out assumed certainty as a decision guide. In addition, though we had hoped to minimize uncertainty with our selection of a short, five year timeframe, we still decided to test it due to the realization already stated: that a lot can change quickly in a region with a history of instability. We also elected to examine making decisions under assumed risk; in other words, that we might be able to make fair predictions on the environment of the Gulf of Guinea in our timeframe, and thus make decisions based on those predictions.

181. Benjamin S. Blanchard and Wolter J. Fabrycky, *Systems Engineering and Analysis 4th Ed.* (Upper Saddle River, NJ: Pearson, Prentice Hall, 2006), 182.

182. Benjamin S. Blanchard and Wolter J. Fabrycky, *Systems Engineering and Analysis 4th Ed.* (Upper Saddle River, NJ: Pearson, Prentice Hall, 2006), 182.

3. Decision Making Under Assumed Risk

"Decision making under risk occurs when the decision maker does not suppress acknowledged ignorance about the future but makes it explicit through the assignment of probabilities."[183] This decision making model seemed to fit our situation perfectly, as we believed that we had attained enough knowledge via our country studies to make a sound prediction on the regional environment given a short, five year time-frame; yet, we also acknowledged our short-comings in being able to gauge exact probabilities which might impact any weights we assigned to mission areas – largely due to the changing nature of the region, but also due to examinations of current practice and guidance with regards to GFS employment .

We assessed decision-making under assumed risk as most appropriate to our study, primarily due to the scope of our timeframe and our accumulated knowledge of the region. Though five years was enough time for the regional geo-political situation to change in individual nations, we did not deem it likely that the regional situation would change to the extent that we would be completely uncertain. A military coup in one country, for example, might be considered likely given the region's history of instability, and might prevent a cooperative partnership for security and stabilization between GFS and that nation's navy; however, it would likely not prohibit such interaction elsewhere in the region. Our assessment was based on historical trends: though civil war and coup d'etats are no stranger to West Africa, they tend to occur without affecting the region as a whole. Such was the case with the armed conflict inside the Democratic Republic of Congo's borders in the late Nineties, as "Angolan, Zimbabwean, and Namibian troops intervened on behalf of the D.R.C."[184] against Rwandan troops; though the conflict permeated borders, it did not collapse the entire Gulf of Guinea region. Realizing that geo-political environments also change due to other, less volatile factors, such as public perception and non-hostile shifts in government views, we believed that five years still remained a relatively near-term – and predictable – timeframe.

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183. Benjamin S. Blanchard and Wolter J. Fabrycky, *Systems Engineering and Analysis 4th Ed.* (Upper Saddle River, NJ: Pearson, Prentice Hall, 2006), 185.

184. Bureau of African Affairs, "Background Note: Democratic Republic of the Congo, U.S. Department of State, http://www.state.gov/r/pa/ei/bgn/2823.htm.

Within this context of assumed risk, we believed that half of the mission needs would occur within the Peacetime Engagement realm, and the other half in the humanitarian realms of HA/DR and NGO/Interagency Coordination. Of the humanitarian mission areas, we assessed that 20% of future interaction would occur in the short-term crisis response of HA/DR, and 30% within the sustained, long-term humanitarian response of NGO/Interagency Coordination. This disparate weighting of mission areas marked a significant break in our process, as we had considered them of equal weight to this point. More simply, however, it represented a necessary step within decision making under assumed risk: the assignment of probabilities.

Our mission weights were generated based on our current knowledge of the region and current trends in GFS pilot employment, and the likelihood of GFS being called upon to fulfill regional needs within those areas. Greater emphasis on Peacetime Engagement, and less on each individual humanitarian mission developed out of our realization that to equally weight two humanitarian missions as compared to the military-to-military aspect of shaping and stability operations might be skewed. Indeed, NGOs and Interagency entities provide crisis response, and might conceivably comprise a first response to crises calling upon GFS's HA/DR capabilities. In essence, why weight two humanitarian missions against one military-to-military mission? We had no reason to maintain that theme, as current pilot programs and the training they administer, have largely been military-to-military endeavors. On the other hand, to ignore the emphasis placed within our strategic guidance on humanitarian assistance and NGO/Interagency coordination would not be correct, either. Indeed, some might argue that the term "shaping and stability" – the operational context under which GFS falls - implies equal weights to military, and non-military emphases, respectively. For this reason, we deferred to a 50/50 split between the humanitarian role (to include the long term role of NGOs and non-military agencies within it) of GFS, and its mission to train and supplement foreign navies and coast guards in peacetime engagement. Within the humanitarian realm, we assigned greater weight to the Interagency/NGO mission (30%) due to the recognition that there is an NGO/Interagency presence inherent to the HA/DR mission (20%).

With our weighted mission values, based on a predicted future environment, we then could attain expected values of ship performance by factoring their total value scores with these mission weights. For example, the HSV scored .91 in Peacetime Engagement (I.E. fulfilled 91% of its attributes in Peacetime Engagement), .79 in HA/DR, and .72 in NGO/Interagency Coordination. The following equation provides the HSV's Expected Value Performance (EVP) results:

$$EVP_{HSV} = \underbrace{(.5 \text{ X } .91)}_{\text{P.E.}} + \underbrace{(.2 \text{ X } .79)}_{\text{HA/DR}} + \underbrace{(.3 \text{ X } .72)}_{\text{NGO/Interagency}} = .88$$

EVP results for the other platforms are illustrated below:

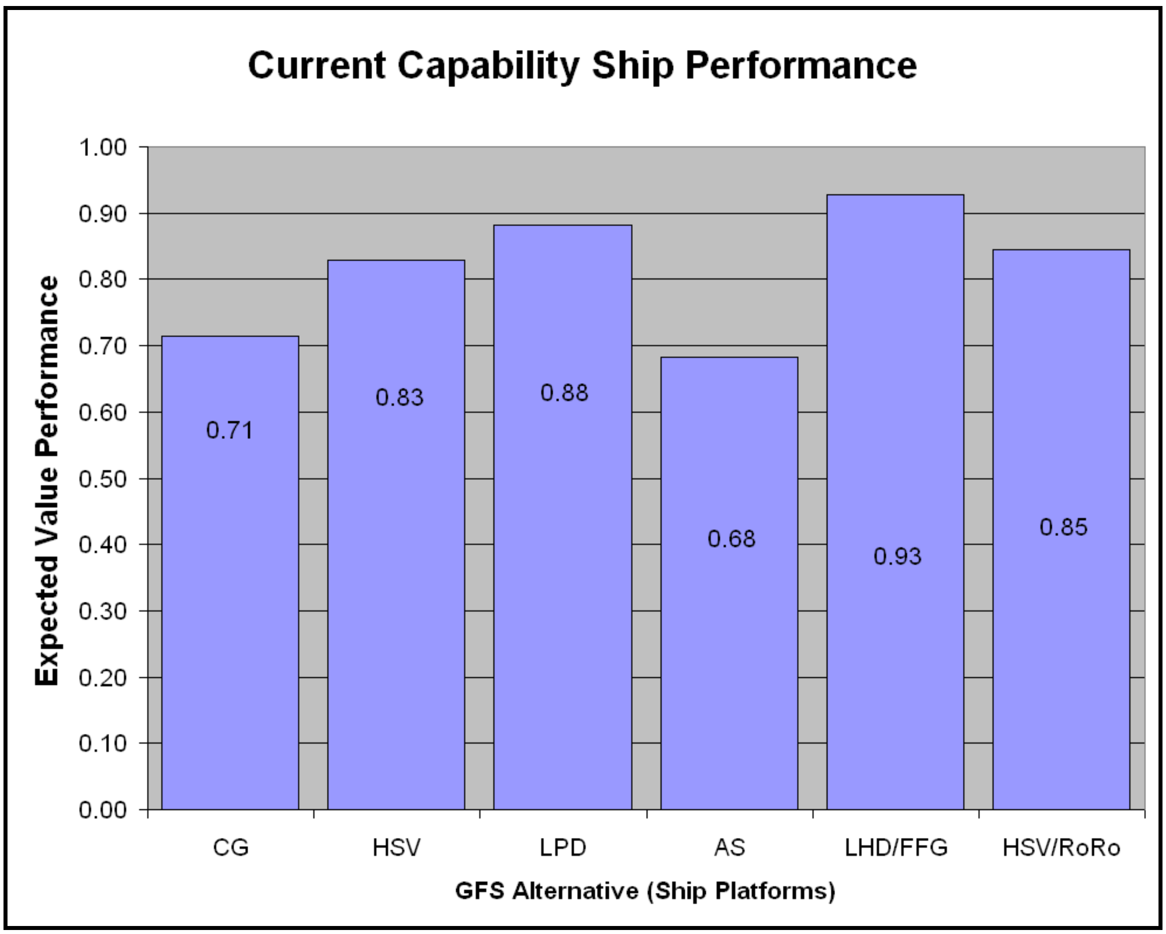

Figure 74: Overall performance of platforms under assumed risk

From the bar chart, our superior platform for GFS out of current inventory is the LHD/FFG combination, as it attained an EVP high-score of .93. The LPD, HSV, and HSV/RORO alternatives followed, in that order, closely grouped between EVPs of .83 and .85. The CG and AS fell out as our least desirable alternatives with regards to performance, with the former's high Peacetime Engagement scores capitulating to the low scores it achieved in HA/DR and NGO/Interagency Coordination. Figure 75 illustrates our "best to worst" list of GFS performers based on decision making under assumed risk.

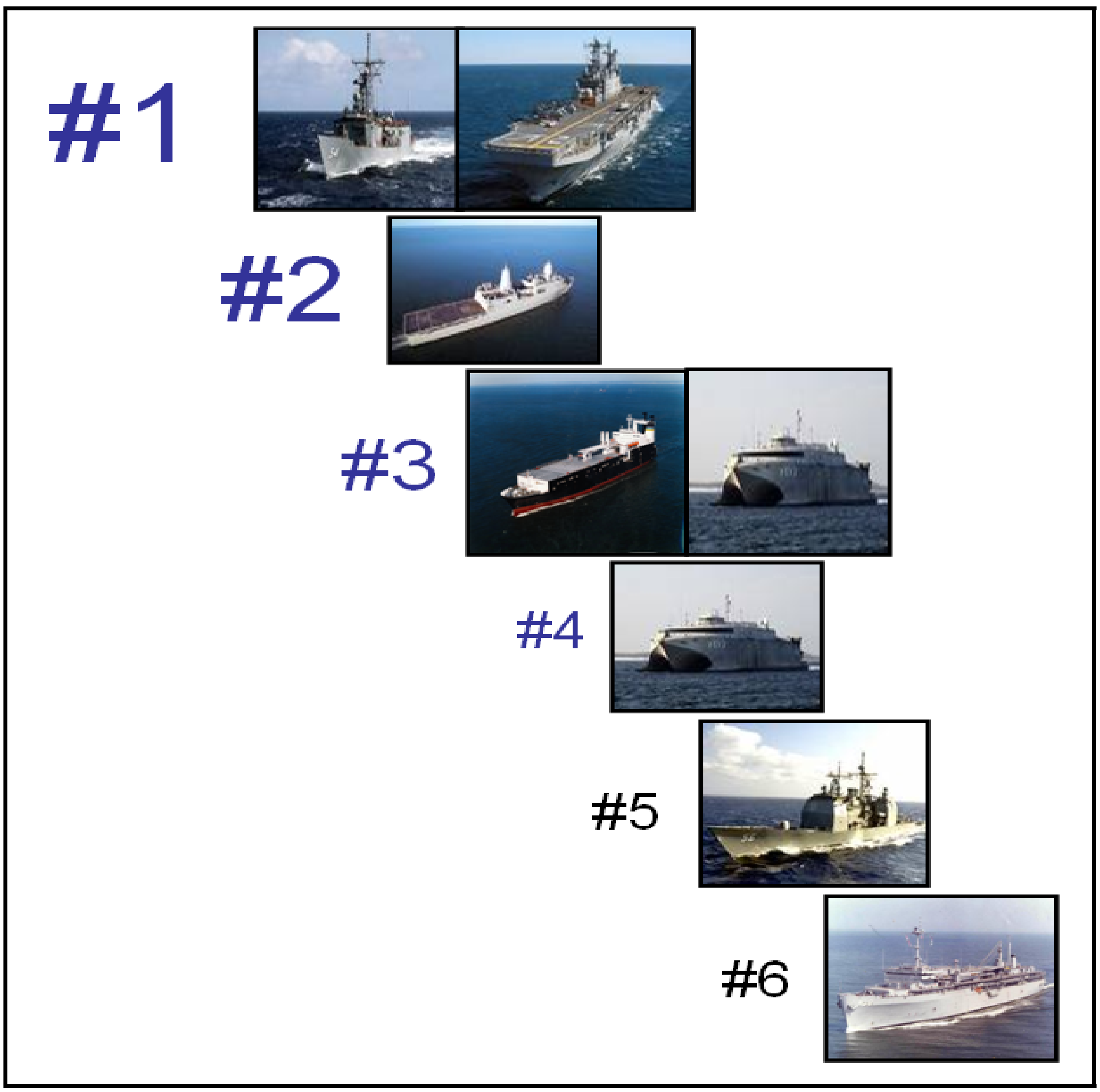

Figure 75: Ranking of Platforms if Making Decisions Under Risk

Beyond a simple order of ranking, additional insights may be gleaned from our bar chart, including those found within general scoring trends and platform groupings.

Scoring trends were generally high, with the lowest alternative achieving a total value score of .68: in other words, our lowest scoring ship was predicted to be able to fulfill well over 2/3 of the desired GFS performance end-state of 100% mission accomplishment. In the Navy's surface community, officers commonly (and informally) refer to the "80% solution" as their mark of performance success; in analytical terms, this would be described as setting our aspiration criteria at 80%, for which four of our platforms exceed it by at least 5%. Some might question such high marks for ships not specifically designed for the task at hand, fulfilling the non-traditional missions of GFS. In response, perhaps the real answer may be gleaned from our attributes and their related criteria, and how they were scored. We found that in many cases, most or all of our platforms greatly exceeded some of the capabilities required of a GFS, often because the requirements were not great. In the communication attributes of each mission area, for example, most ships ranked very highly because (with the exception of communications ashore in an austere environment) the communications needed for interoperability with West African ports, navies and coast guards remained simple – almost all current capability ship alternatives met it (or scored very well). As long as they met the requirement fully, they achieved a score of 100%, regardless of if their relative overall communications capabilities: though the LPD's communication capability greatly exceeds that of an HSV in the realm of progressive technology, both get the job done and meet the requirements as set forth by our communication attribute's criteria. This high scoring trend may also give evidence to the multi-use characteristic of ships in current inventory as well-suited for GFS missions.

Ships grouped closely by score deserved a second-look before quick assessments on performance could be made. In the high-scoring group of the number two, three and four ships (LPD, HSV/RORO, HSV), we had to consider that they might have been too closely scored to declare any outright "winners." For example, one might conclude from the small performance difference of .02 between the single HSV alternative and the

combination package of the HSV and RORO, that the RORO simply does not add a lot in performance that can not already be handled by the smaller, faster vessel on its own. On the other hand, that 2% of value-added performance may become vitally important to a particular facet of the GFS mission given a possible event: perhaps it is the cargo piece that becomes suddenly important in the event of a natural disaster. In the case of the low-scoring group (CG/AS), before writing them off as unacceptable GFS alternatives, we had to consider that the CG performed Peacetime engagement exceptionally well, tying with the LPD. Should the Peacetime engagement mission become more important, or should technologies become available to improve its performance in the humanitarian missions, the CG might redeem itself as a viable alternative. Of course, the best method by which to resolve such questions is to conduct several repeating analyses, so as to normalize our results and determine a standard error by which to assess if rankings in these groups are viable; unfortunately, our FNA provided *one* set of data points, and we simply had to accept the total value scores – and their resulting EVPs (as close as their groupings might be) – as accurate. In addition, these groupings highlighted the need to consider risk and its impact on our results, before concluding our FNA.

4. Decision Making Under Uncertainty

Understanding that one might argue the Gulf of Guinea in 2012 is utterly unpredictable, citing the history of civil wars and lack of existing maritime security this far into the 21st century, we decided to test how our conclusions might vary from those under assumed risk. Indeed, we realize that the probabilities that we assigned with assumed risk were largely subjective in nature, and some engineers – or even combatant commanders – might prefer a decision making system based on uncertainty, due to the lack of any "hard" data supportive of predicting an operating environment five years out in the region. In such a case, decision making under uncertainty is called for.

Two rules for decisions under those of uncertainty depend on the nature of the decision maker themselves: the maximum-minimum (maxi-min) rule represents the most pessimistic outlook for the future, while the maximum-maximum (maxi-max) rule represents the most optimistic. Indeed, as humans, decision-making is often made on how optimistic or pessimistic we are. Just as their names suggest, the maxi-min rule

"will lead to the alternative that assures the best of the worst possible outcomes,"[185] and the maxi-max rule "will choose the best of the best possible outcomes."[186] In terms of GFS, the "outlook for the future" relates to a regional commander's outlook – or "gut feel" - for the future operating environment of his or her region, realizing that we cannot predict that future with *any* certainty. This regional future-state directly impacts which of each of the three mission areas will take priority, or will be weighted more heavily. However, in this sense of mission priority, we must think of this in terms of the lowest (pessimistic view) or highest (optimistic view) scores from the three missions for each ship, rather than by mission weight.

Our analyses of decision making by pessimistic and optimistic commanders may better highlight this approach.

A pessimist would say that our guess on what mission will be most important will most likely be completely inaccurate, and that we should therefore assume a "worst case," selecting the worst scores from out of the three mission areas for each ship, and using those values as our baseline from which to choose our best GFS alternative platform. Out of these "worst case" value scores, we selected our vessel based on the best of those scores (see Figure 76).

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185. Benjamin S. Blanchard and Wolter J. Fabrycky, *Systems Engineering and Analysis 4th Ed.* (Upper Saddle River, NJ: Pearson, Prentice Hall, 2006), 189.

186. Benjamin S. Blanchard and Wolter J. Fabrycky, *Systems Engineering and Analysis 4th Ed.* (Upper Saddle River, NJ: Pearson, Prentice Hall, 2006), 189.

GFS Decision by a
Pessimist for an Uncertain
Gulf of Guinea Environment

	PE	HA/DR	NGO/Interagency	MINIMUM
CG	0.97	0.61	0.36	0.36
HSV	0.91	0.79	0.72	0.72
LPD	0.96	0.87	0.76	0.76
AS	0.72	0.76	0.57	0.57
LHD/FFG	0.97	0.92	0.86	0.86
HSV/RORO	0.85	0.80	0.87	0.80
				0.86 MAXI-MIN

= Lowest scored mission per alternative

= Best alternative (maxi-min)

Figure 76: Scores When Making Decisions Under Uncertainty (Pessimist)

In this case, our LHD/FFG combination broke out as our best GFS platform selection. Considering the worst case – that a regional commander guessed the wrong mission predominance and operating environment in the Gulf of Guinea in 2012 – this selection did not prove too poor of a choice, with an 86% capability in this worst case. The "down side" to this decision making would be that our commander would have missed the opportunity to achieve a slightly higher capability (87%) with the HSV/RORO combination.

An entirely optimistic commander would base his or her decision, in the absence of certainty, on the hope that the future-state of the region will dictate that the mission with the highest priority will be the one had the highest score under it – and the platform alternative that achieved that score. Optimists like this might base their outlook on a belief in divine intervention, a hunch, or a gamble on the hope for "the best case." Therefore, for this scenario, we selected our vessel based on the best of the best scores (see Figure 77).

GFS Decision by an
Optimist for an Uncertain
Gulf of Guinea Environment

	PE	HA/DR	NGO/Interagency	MAXIMUM
CG	0.97	0.61	0.36	0.97
HSV	0.91	0.79	0.72	0.91
LPD	0.96	0.87	0.76	0.96
AS	0.72	0.76	0.57	0.76
LHD/FFG	0.97	0.92	0.86	0.97
HSV/RORO	0.85	0.80	0.87	0.87
				0.97 MAXI-MAX

= Lowest scored mission per alternative

= Best alternative (maxi-max)

Figure 77: Scores When Making Decisions Under Uncertainty (Optimist)

In this case, two alternatives tied as the best: the LHD/FFG combination and the CG, both for their exceptional performance in the Peacetime Engagement Mission. If the Gulf of Guinea shaped up into a predominantly military-to-military Peacetime Engagement environment, either of these choices would prove ideal. The obvious down-side to this decision making is if the decision maker's outlook is wrong: in the case of the CG and a predominant NGO/Interagency Coordination mission, our regional commander might not attain the next promotion he or she had been hoping for due to their overly optimistic disposition.

The previous two examples demonstrate the extremes of human disposition, but in reality, most people fit somewhere in between. One means by which to address the proper decisions under uncertainty, given the particular nature of the decision maker, involves the Hurwicz Rule: "an index of relative optimism and pessimism."[187] Applying this rule to our payoff matrix yielded the following results:

[187]. Benjamin S. Blanchard and Wolter J. Fabrycky, *Systems Engineering and Analysis 4th Ed.* (Upper Saddle River, NJ: Pearson, Prentice Hall, 2006), 190.

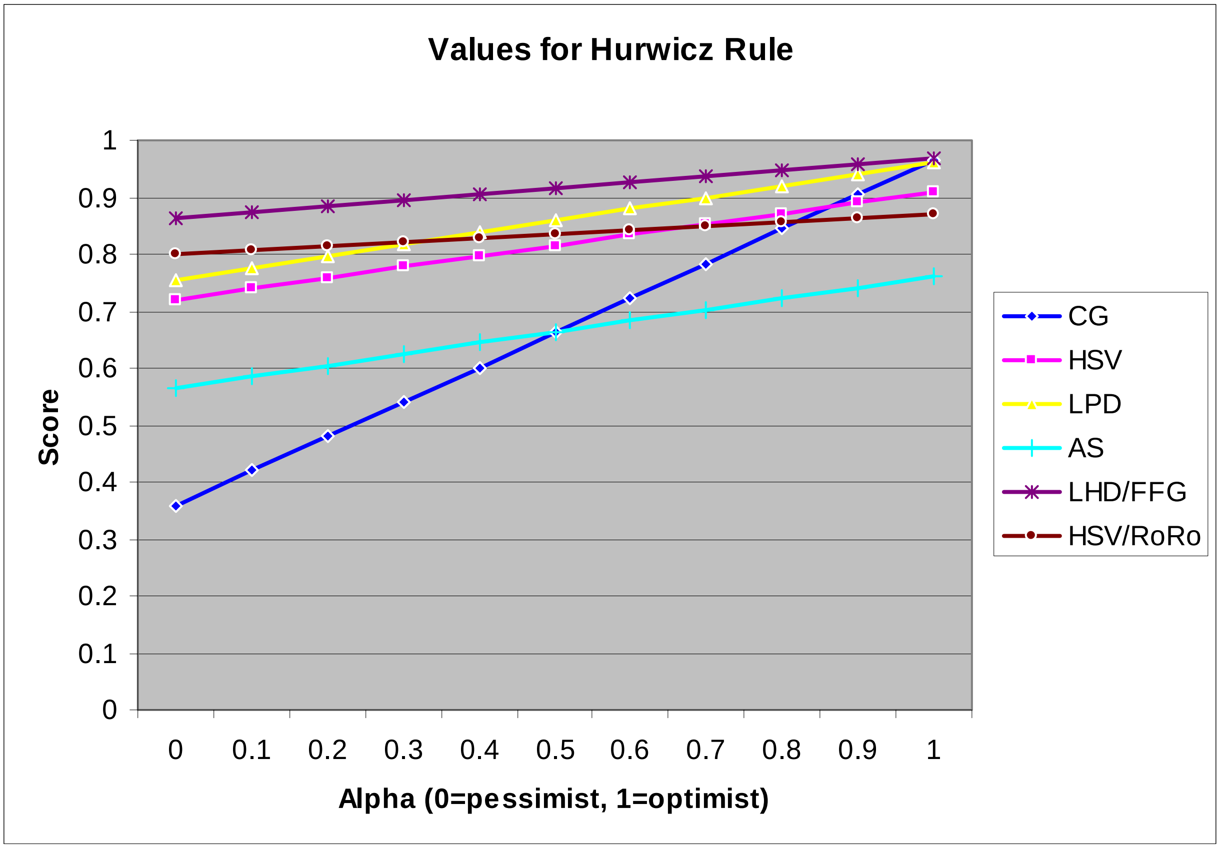

Figure 78: Making Decisions Using Under Uncertainty - Hurwicz Rule

Here, an alpha value (α) represents the index of optimism - or what our decision maker regards as his or her level of optimism or pessimism - with α = 0 indicating complete pessimism, α = 1 indicating complete optimism. If a regional commander indicated that they were slightly more pessimistic than optimistic, telling the analyst that "I tend to be a 'glass half-empty' kind of guy, but just slightly," then we might logically determine that α = .4. Applying this value to our Hurwicz rule reveals that this particular commander would still consider the LHD/FFG combination as our best alternative, but at his particular alpha value, the LPD begins to "edge-out" the HSV/RORO as his second choice (whereas a more pessimistic commander (α < .3) would prefer the HSV/RORO) based on their changing scores as alpha values change. The order of ranking for ship alternatives remained relatively unaffected by the decision maker's disposition – or alpha value – with two exceptions: the HSV/RORO (dropping from 2nd to 5th as optimism

increased), and the CG (rising on a steep slope from dead-last to a tie for first as optimism increased). Obviously, the optimism or pessimism of a regional commander will have an impact on their decisions for GFS alternatives when those decisions are made under uncertainty.

Decision making under uncertainty hardly proved ideal in our study. Though the analysis of our purely pessimistic decision-maker yielded results with a relatively low "down-side," the shortcomings revealed by the analysis of our purely optimistic decision-maker demonstrated a more dramatic difference between good and poor choices. In addition, both methods over-simplified the art of decision-making: most people – and most likely *all* people in positions of command - are neither purely pessimistic nor optimistic. Our Hurwicz Rule offered a more realistic method by which to determine best alternatives in an uncertain environment. Unfortunately for all three of these methods, all are based purely on subjective evaluation.

5. Summary

The majority of GFS alternatives maintained a similar order of ranking between decisions made under risk, and those under uncertainty, with minor changes and fluctuations: the LHD/FFG combination remained number one in performance, the AS continued to fall out toward the bottom, and everything else fell somewhere in between with the only dramatic change occurring with the CG in an uncertain environment. As we believed we had sufficient appreciation for the region's future within the next five years, we elected to continue through our JCIDS process with our FNA results from our analysis of decision-making under assumed risk.

G. FACTORING COST

Unfortunately, best alternatives fail to transition from paper to the fleet without considering the dampening (and real world) effect of cost. Maintaining focus on determining the "most effective" GFS system alternative, we filtered our list of ranked ships through the element of cost.

1. Overview of Approach

Cost is complex. Determining what costs best represent what a decision maker will pay for GFS depends on several variables: how long one intends to pay for the vessel (life-cycle costs), who pays for the use of the vessel, what phase of the lifecycle the vessel is in, which factors from within that phase (or phases) one may elect to use in their analysis, and whether to base these figures off of one particular ship or an entire class of ship.

a. Time

We assumed a 6-month operating period for which to measure our costs, basing this on our presumed 6-month on-station time. We believed that longer periods could simply be extrapolated, and costs for such cases would remain proportional.

b. Cost and the Decision-Maker

Regarding who pays for GFS, we chose to view cost from a macro level in terms of "cost to the Navy." Realizing that this broke from our regional commander viewpoint in our decision process for attaining the best performing alternatives, we made a logical assumption that even when estimated at the combatant/regional commander or fleet commander level, costs would remain fairly proportional to those incurred by the Navy. Another reason for this choice was the inability to break-out some long-term maintenance costs - such as major overhauls - from some of our ships: a factor that the Navy must account for, but which fleet commanders most likely will not.

c. Life Cycle Phase

From the three primary types of ship lifecycle costs - Research and Development (R & D), production, and operation and sustainment (O & S) – we focused solely on O & S costs. Since our FNA alternatives were from current inventory, we considered R & D and production costs of minimal importance. We realized this could change as a result of our FSA, should new construction of lead-ship or follow-ship GFS platforms become an alternative, thus requiring us to factor more life cycle cost elements.

d. Cost Elements

In its estimation of O & S costs for naval vessels, the Navy Visibility and Management of Operating and Support Costs (VAMOSC) management information system includes four elements:

- *Element 1.0 Direct Unit Cost*: the cost most readily associated with deployment costs; includes fuel consumption, personnel manning, and services.
- *Element 2.0 Maintenance - Intermediate*: labor and material costs by ship's force and commercial suppliers in the day-to-day maintenance of the ship.
- *Element 3.0 Maintenance and Modernization - Depot*: Scheduled and non-scheduled depot level work, and major overhauls. Sometimes thought of as "long term" or "major" maintenance. Usually scheduled between deployments, and often involves yard work.
- *Element 4.0 Other Operating and Support*: training, publications, and technical services.

Of these, direct unit costs dwarf the others, but the depot level maintenance costs remain significant (see Appendix D for exact costs). We debated factoring in the latter costs, as a GFS usually would not incur them while deployed (except in the case of a major accident), and deployment costs were what we hoped to assess; however, our inability to readily access element 4.0 costs for MSC ships while understanding they were included in O & S costs provided by MSC, influenced us to include them for all ships.

We followed a similar construct in determining what constituted O & S costs for our helicopter connectors, and employed VAMOSC data to assess these costs, as well. Though broken into seven cost elements, their contents were similar to those provided for ships (see Appendix D for exact costs and individual element break-downs).

Unfortunately, VAMOSC does not possess data for our waterborne LCAC connectors,[188] so we assumed minimal cost-added to their mother-ships' O & S Costs; we also believed it a safe assumption that waterborne RHIB connecters would provide minimal additional cost.

e. The Choice Between Individual Ship and Class of Ship

We believed that we could attain cost data more reflective of a GFS deployment by extracting information about ships that had operated in a similar environment to what we envisioned in the Gulf of Guinea. We considered the standard Mediterranean deployment the closest in resemblance, realizing that the frequent port calls (indicative of a Mediterranean deployment) more closely resembled the frequent port visits of a GFS in the Gulf of Guinea than any other regional deployment. This desire drove us to concentrate on individual ships, as cost data from class type would skew our data with averages from non-deployed ships, and from deployed ships with few port visits. We found "perfect fits" for our CG, LHD/FFG, and AS alternatives; however for the LPD, we had to interpolate data since she had never deployed. For the HSV and RORO, cost data were driven by factors not based on Mediterranean deployments, but by the fact that they are the *only* vessels within their specific class of ship.

2. Cost Data Analysis

We converted VAMOSC and MSC data into usable, total O & S costs for each of our GFS alternatives. How we did so is best described in terms of ships for which comprehensive VAMOSC data was available (USN grey-hulled ships), ships for which data had to be extracted elsewhere (MSC ships), and connectors embarked on those ships.

a. USN Grey Hulls

Three specific ships (USS Iwo Jima, USS Nicholas, USS Philippine Sea) that completed a Mediterranean deployment in FY 2006 were selected to calculate the average cost for a 6-month deployment. The remaining two ships were utilized due to

188. Virginie Collin-Banerji, e-mail message to LT Kathryn Ottersberg (SEA-12), November 1, 2007.

homeport location (USS EMORY S LAND) and only ship in class (USS SAN ANTONIO). It should be noted that the USS SAN ANTONIO was commissioned in 2006, so calculations were based on 273 days of service vice 365 days. The annual cost for each ship was divided by the number of days in service for the given year; for example, the USS IWO JIMA was in service for 365 days and had a total annual cost of approximately $97.8 million, or $264,900 per day. This daily cost was multiplied by 180 to provide a 6-month deployment cost of $47.7 million.

b. MSC

VAMOSC data for MSC ships proved insufficient, with maintenance and other costs missing or incomplete (See Appendix D). MSC provided O & S costs based on a daily rate for the RORO, assessing it as $81,155 per day.[189] Mr. Keith Bauer, Program Manager for MSC's Prepositioning Program, based the HSV's daily O & S cost on a recently completed market survey, stating "our estimate for the ship, which includes all costs like crew, fuel, port, M&R, [and] overhead is approximately $69,000 per day."[190] Multiplying these daily costs by 180 days, we computed 6-month on-station costs of $12.4 million for the HSV, and $27.0 million for the HSV/RORO alternatives.

c. Connectors

The total cost of each aircraft for a standard 6-month deployment was calculated utilizing information provided from the VAMOSC database. The values given in the database are based on the fleet-wide total number of specified aircraft and the total number of flying hours for that aircraft; for example, there were 194 CH-46E helicopters that flew 53,862 hours in FY 2006. The average annual flying hours per aircraft is 251, or 21 flying hours per month. The annual cost for the CH-46E is approximately $619.7 million, or $2.9 million per aircraft, and finally $11,500 per aircraft flying hour. The average cost for a 6-month deployment per helicopter is $1.4 million dollars, calculated

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189. Keith Bauer, MSC PM3, phone conversation to LCDR John Montonye (SEA-12), November 14, 2007.

190. Keith Bauer, MSC PM3, phone conversation to LCDR John Montonye (SEA-12), November 14, 2007.

by multiplying the average cost per flying hour ($11,500) by the average flying hours per month (21) for a monthly cost of $241,600, which was then multiplied by 6.

d. Summary of O & S Cost per Vessel

Total O & S costs for all six of our alternatives were computed by adding ships costs to those of the connectors they employed. The cruiser, for example, carries two SH-60Bs (other ship connector complements provided in Figure 33); therefore, we simply multiplied SH-60B O & S costs by a factor of two, and added it to the cruiser's VAMOSC O & S cost to result in a total cost for that particular GFS alternative. Figure 79 summarizes our results:

Total O & S Costs for GFS Alternatives

		ALTERNATIVES					
	per aircraft	CG	LHD/FFG	LPD	AS	HSV	HSV/RORO
Ship Cost		19,318,163	60,115,412	19,594,640	47,678,131	12,420,000	27,027,900
SH-60B Cost	1,913,419	3,826,838	3,826,838	0	0	1,913,419	1,913,419
CH-46E Cost	1,438,244	0	17,258,928	2,876,488	0	0	0
CH-53D/E Cost	2,272,803	0	20,455,227	0	0	0	0
	SUM:	23,145,001	101,656,405	22,471,128	47,678,131	14,333,419	28,941,319
	Rounded SUM:	23M	102M	22M	48M	14M	29M

= Total O & S Cost

Figure 79: Total O & S costs for GFS Alternatives

3. Cost-Benefit Analysis

From the results outlined Figure 79, one notices that the high performance of the LHD/FFG combination comes with a price - as do all of the GFS alternatives. With our best performance and least costly results, we utilized a decision criterion known as cost-effectiveness (cost-benefit) to maximize performance (I. E. effectiveness) while reducing cost.

To help make the decision, our performance and cost were plotted against each other to produce Figure 80.

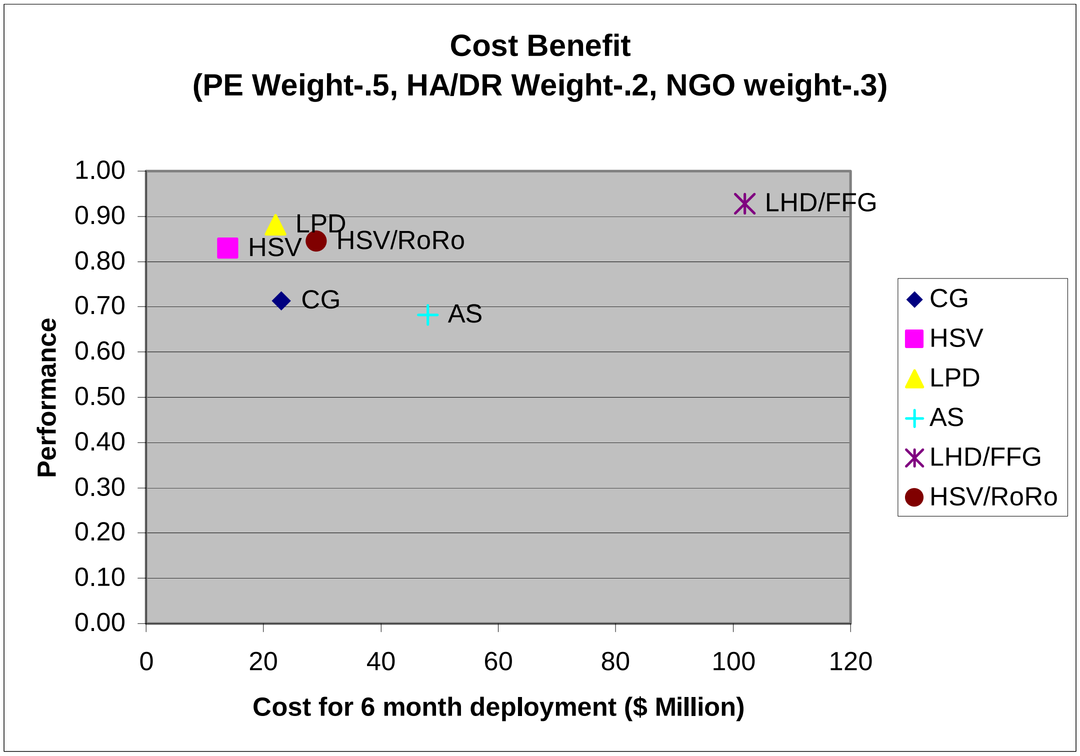

Figure 80: Cost-Effective plot of alternatives

There are a few ways to use this plot for analysis in decision-making theory. The first is to determine *dominance*. When a platform has an alternative that is at least as effective and has less cost, then it is said to "dominate" and be cost-effective. The easiest way to visualize this is overlay a northwest quadrant with the vertex on the alternative (as in Figure 81)[191] If any other alternative lies within this quadrant, it has a competitor that performs better and for less cost. In this example, there is no reason to ever choose the AS because it is dominated by the HSV, HSV/RORO, LPD, and CG. Using this method, it is apparent that the alternatives which are not cost-effective are the AS, CG, and HSV/RORO.

[191]. Daniel H. Wagner, W. Charles Mylander, and Thomas J. Sanders, ed., *Naval Operations Analysis, 3rd ed*. (Annapolis, MD: Naval Institute Press, 1999), 43.

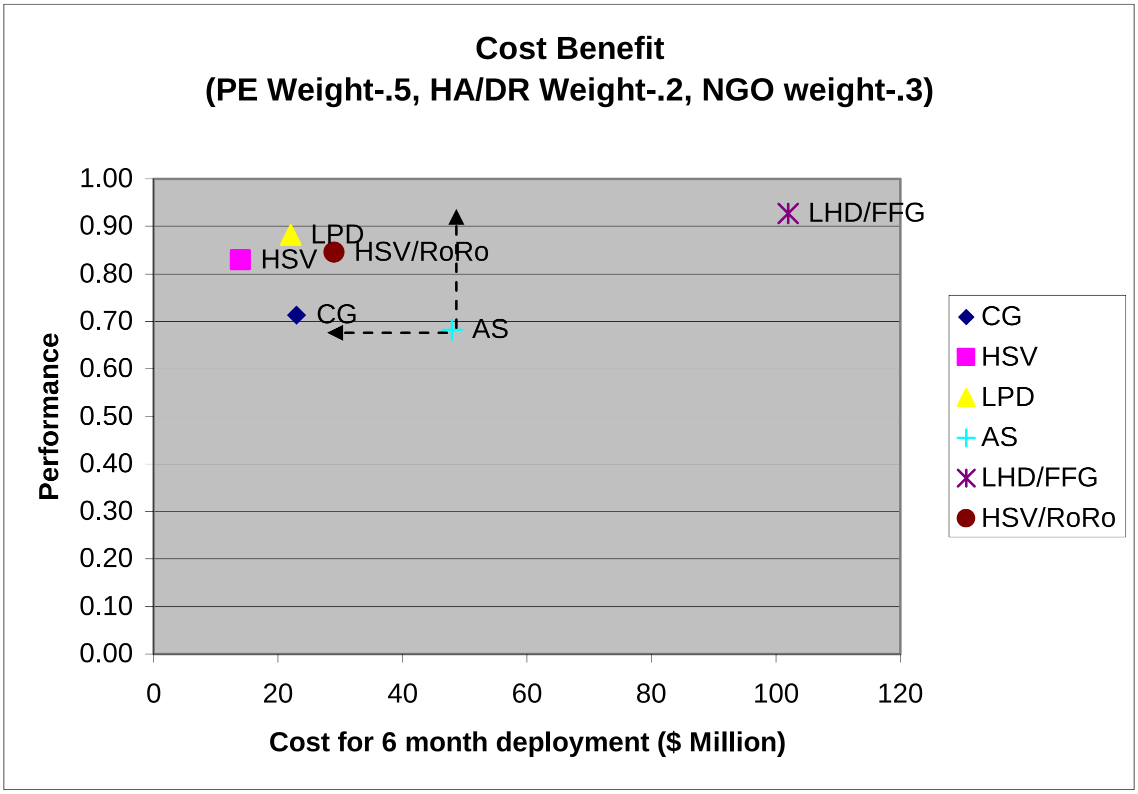

Figure 81: Cost-Benefit Determining Dominance

Another method to aid the decision maker is to determine the most effective option, given a specific budget. If there was a maximum budget dictated, a line can be drawn on the x-axis to eliminate alternatives. In the Figure 82 example, a cost budget of $25 million would imply that the best option is a LPD. Conversely, one could determine the least cost incurred to meet a given effectiveness requirement.[192] In the Figure 83 example, an acceptable performance threshold of .85 produces a minimum cost of $22 million from the LPD.

192. Daniel H. Wagner, W. Charles Mylander, and Thomas J. Sanders, ed., *Naval Operations Analysis, 3rd ed*. (Annapolis, MD: Naval Institute Press, 1999), 44.

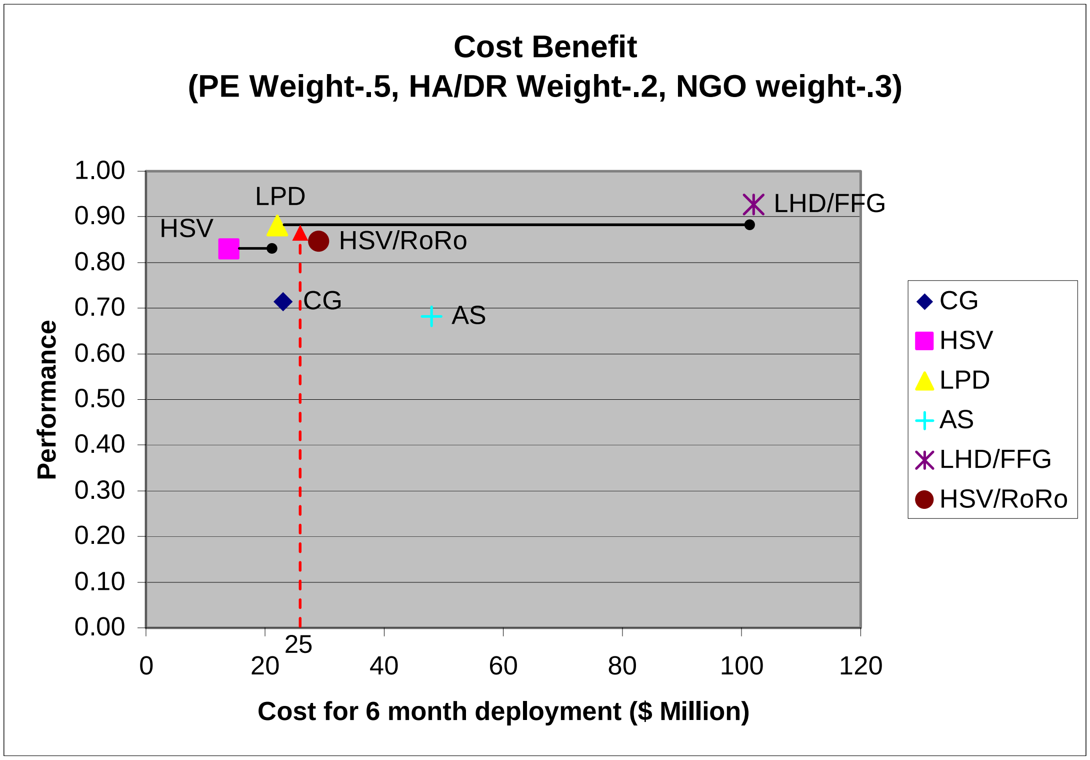

Figure 82: Cost benefit- Determining best performance given a budget

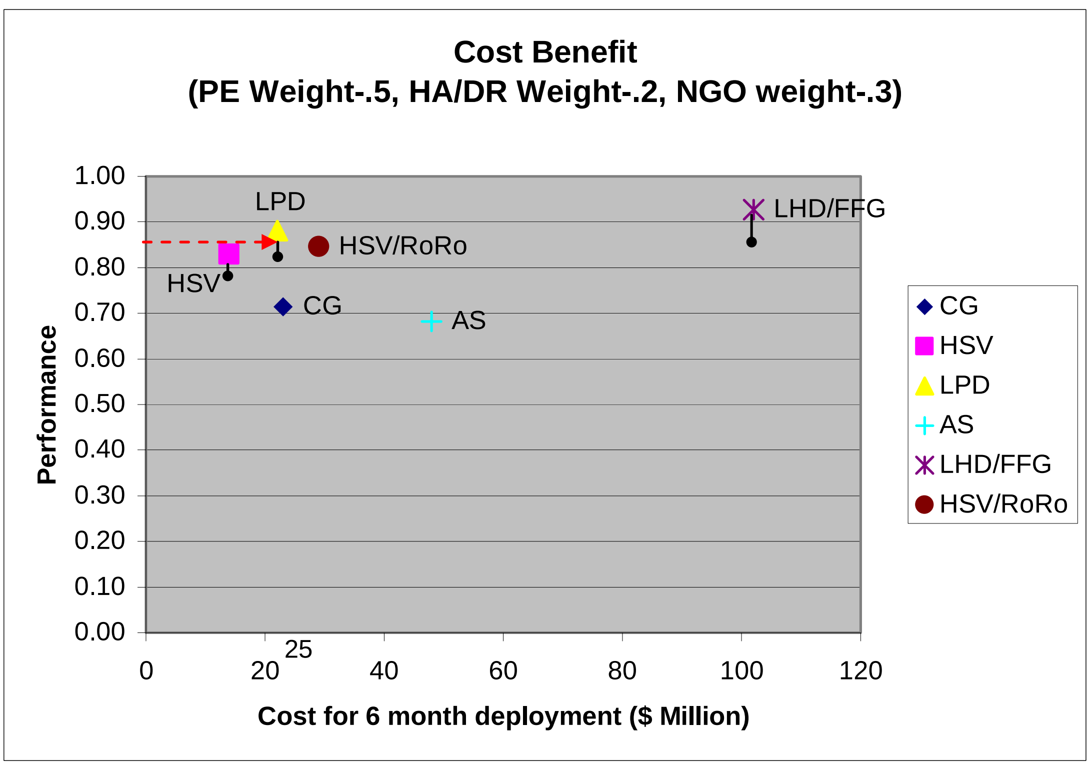

Figure 83: Cost benefit- Determining cost given a minimum performance

The last way to utilize the plot for decision-making is by examining the cost-effective actions (determined earlier) in terms of the *efficiency frontier*. Figure 84 shows the concave envelope (the lowest concave function graph which lies on or above the set of alternatives) with a theoretical alternative (Platform X). There are no dominate alternatives in the northwest quadrant but it does fall below the efficiency frontier.

Assume that Platform X has a performance score of .90 and a cost of $85 million. This produces a rise in performance from the LPD of .02 (.90-.88 = .02) with an associated rise in cost of $63 million (85-22 = 63). Now take the increase from LPD to LHD/FFG as an increase in performance of .05 (.93-.88 = .05) and an increase in cost of $80 million (102-22 = 80). The slope is less from LPD to Platform X than the one from the LPD to the LHD/FFG (.02/63 vice .05/80). Here, a greater slope is desirable, as it indicates greater performance value per dollar; therefore, in this example one may conclude that the increase in performance per increase in cost is worse with Platform X. A decision maker with a theoretical budget of $90 million may try to acquire the additional $12 million to use the LHD/FFG option; thereby reaching the efficiency frontier.[193]

[193]. Daniel H. Wagner, W. Charles Mylander, and Thomas J. Sanders, ed., *Naval Operations Analysis, 3rd ed.* (Annapolis, MD: Naval Institute Press, 1999), 44.

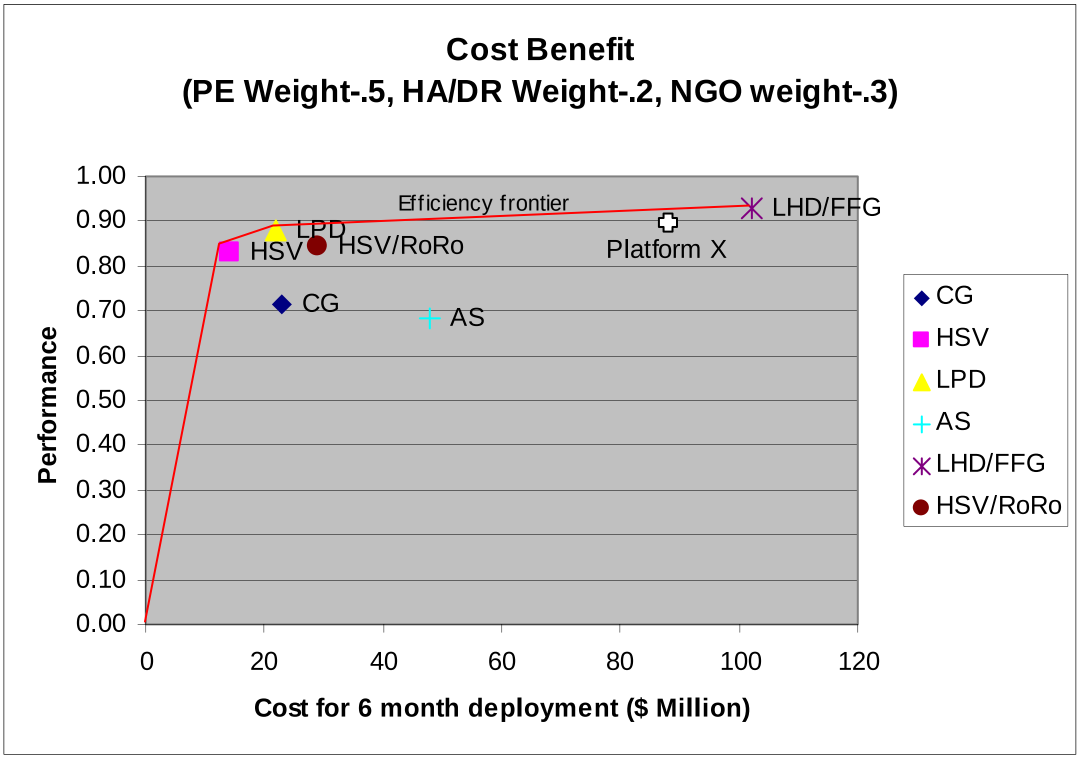

Figure 84: Cost benefit - the efficiency frontier

Although there are no alternatives that fall into this situation, there is a corollary to the efficiency frontier. Often referred to as the "knee in the curve", this is the point where the decision maker gets the most "bang for the buck". Referring to Figure 85, this knee lies in the vicinity of the HSV and LPD alternatives.

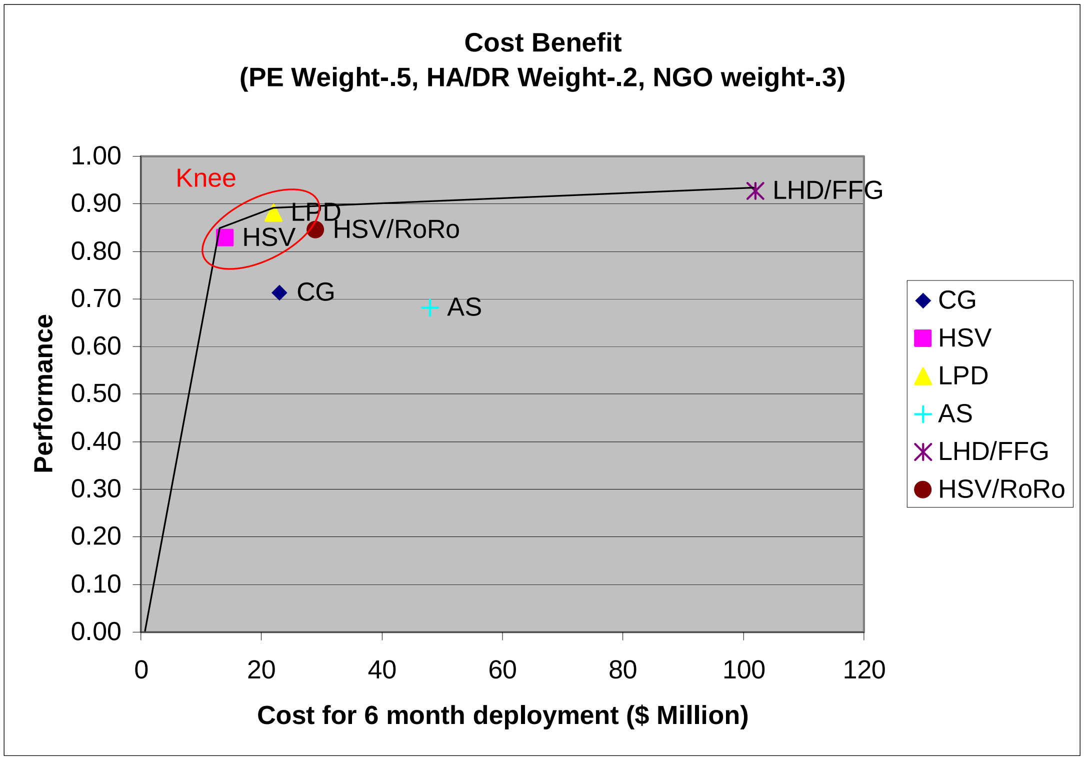

Figure 85: Cost benefit- Knee in the curve

There are multiple ways to analyze the performance and cost of the six platforms. Given that we assumed no budget or performance minimum to develop a threshold, the best theories to use were the dominance and the knee in the curve. Using the numbers generated by our FNA, we determined the HSV, LPD, and LHD/FFG platforms as cost-effective choices for GFS in the Gulf of Guinea. Within those, the two options that are the best are the HSV and LPD, as they fall within the "knee."

Figure 86: Top Platform Alternatives to GFS from Current Capability

One final note to reiterate is that the performance values are subjective in nature and specific to performing a single mission at a time (the assumptions we used). Hypothetically, the HSV/RORO alternative could have increased performance when performing multiple, simultaneous missions in the Gulf of Guinea. This would move the performance up (creating a new efficiency frontier). Indeed, this may become quite possible given the adaptable features of an MPF(E) RORO.

H. WHAT IS THE GAP?

Though some studies do conclude with FNA, we maintained our desire to look beyond the most effective GFS platforms from current inventory. We hoped to explore improvements to those platforms, or to incorporate new assets or concepts to fulfilling the role of GFS. With that in mind, the outcomes of which ships finished "at the top" remained only one tangible result of FNA. Another was what would enable us to explore future concepts: "the gap."

The "grass roots" of the gap between current capability and desired capability lies within our attributes, and is performance based. Deficiencies in value scores quantify

that gap. An example is the gap of 34% by the AS within the attribute of [minimizing military] appearance. Such gaps prove useful when trying to find remedies that may result in improved performance. Painting the AS black, for example, would completely close this particular gap, resulting in a platform value score of 100% for that attribute. Indeed, these attribute gaps contain potential as tools in identifying particular solutions to improving performance.

On a macro level, we had to consider that we were seeking the most effective solution (cost and performance) – not a system based solely on a couple of attributes. Therefore, we identified a second type of gap, though closely knitted to those identified in the attributes: a cost-benefit gap. A quick look at our cost-benefit chart, for example, reveals a cost-benefit gap with the AS, HSV/RORO, and CG alternatives: they each fall below our cost-effective line. The solution to this cost lies in two factors, and may best be summed by the questions that should be asked: "How can I move the CG up (in performance) and/or to the left (in decreasing cost)?" In essence, this provides a macro view of the gap, but to close it, we must seek specific means by which to improve cost and/or performance.

I. RISK ANALYSIS

Looking beyond the results of the best and most cost-effective GFS alternatives from of current capability, choosing the platform to perform GFS encompasses one final aspect: risk management. There are inherent risks associated with any decision, course of action, or assumption. Many chose to merely avoid addressing risk, but in the case of GFS, risks cannot be ignored due to the size of the endeavor, the changing nature of international relations, and a direct correlation to worldwide security.[194] With the dynamic future of Department of Defense missions, funding, and regional partnerships in Africa, risk management is essential.

194. Harold Kerzner, *Project Management: A Systems Approach to Planning, Scheduling ,and Controlling* (New Jersey: John Wiley & Sons, Inc., 2006), 709.

1. Context

In the context of a traditional "project," risk management remains a continual process executed throughout the life cycle and is not merely an act of identifying risk; it is a process used to reduce the surprises that may cause problems in the future. There are four steps in risk management process: [195]

- *Risk Planning*. Developing and documenting risk strategy, handling plans, and monitoring changing risks.
- *Risk Assessment*. Identifying and analyzing the likelihoods and impacts of risk within the project.
- *Risk Handling*. Identifying, selecting, and implementing strategies to set risk at an acceptable level; determining who is responsible, cost, and schedule specifics.
- *Risk Monitoring*. Systematically tracking and evaluating the risk handling decisions made using established metrics, then updating the strategies.

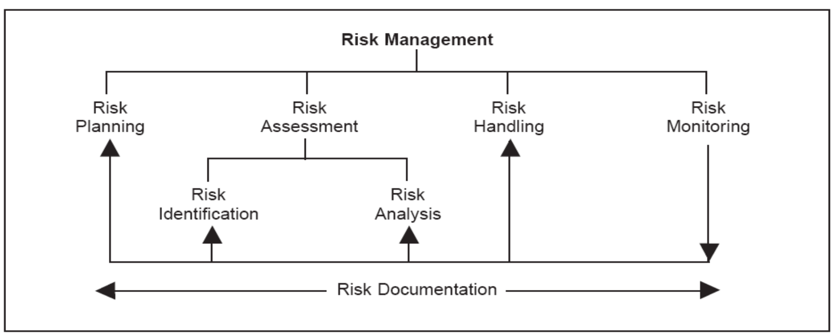

Figure 87: The steps in Risk Management[196]

However, in the context of this study, the only areas addressed are *risk assessment* and *risk handling*. The CBA User's Guide points out that in a Quick Turn CBA, "being a loyal subordinate, you will deliver a product one time. But, you will probably be uneasy

195. Harold Kerzner, *Project Management: A Systems Approach to Planning, Scheduling ,and Controlling* (New Jersey: John Wiley & Sons, Inc., 2006), 718-720.

196. Louis Simpleman, Paul McMahon, Bill Bahnmaier, Ken Evans, Jim Lloyd, *Risk Management Guide for Department of Defense Acquisition, Fifth Edition (version 2.0)* (Fort Belvoir: Defense Acquisition University, June 2003), 7.

about it… [You must] communicate the risk of the assessment - that is, where it might be wrong and what the consequences might be."[197]

2. Risk Defined

"Risk is a measure of the probability and consequence of not achieving a defined project goal".[198] More simply expressed in Figure 88, Risk = *f*(likelihood, impact). Risks are future events that contain variability or uncertainty (with undesirable outcomes) and are caused by some hazard, event, or decision. Knowing what those hazards are (and preemptively planning for them) can greatly reduce risk. We elected to accomplish such risk reduction by being proactive rather than reactive, and by identifying the high-risk assumptions in this study.

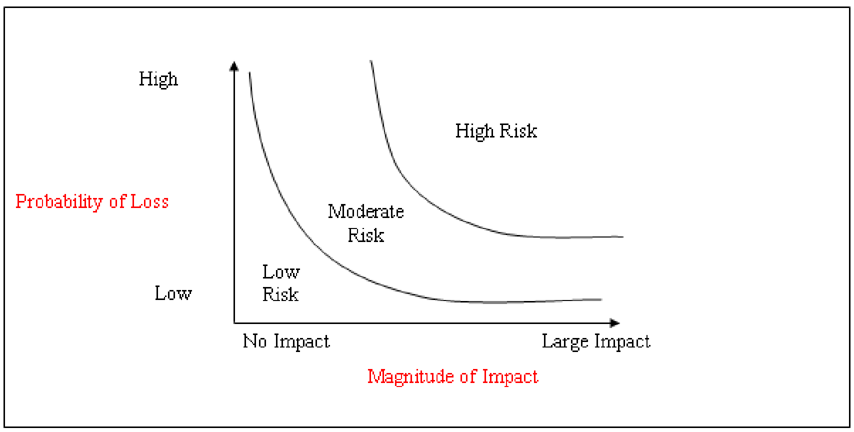

Figure 88: Depiction of risk categories[199]

3. Risk Assessment

Our first step in assessing risk associated with GFS consisted of *identifying* potential issues. This phase focused on answering the question, "What IF something happens?" There are many types of risk that fall into categories such as cost, funding,

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[197]. U.S. Office of the Chairman of Joint Chiefs of Staff. *Capabilities-Based Assessment (CBA) User's Guide (Version 2), Force Structure, Resources, and Assessments Directorate (JCS J-8)*, (Washington, DC: GPO, 2006).

[198]. Harold Kerzner, *Project Management: A Systems Approach to Planning, Scheduling ,and Controlling* (New Jersey: John Wiley & Sons, Inc., 2006), 709.

[199]. Harold Kerzner, *Project Management: A Systems Approach to Planning, Scheduling ,and Controlling* (New Jersey: John Wiley & Sons, Inc., 2006), 710.

management, political, production, and schedule (there are also technical and engineering risks, but are much less applicable in this study).[200] In order to identify potential risks, there are objective and subjective sources which to extract information. They include, but are not limited to:

- Assumption analysis
- Brainstorming
- Decision drivers
- Expert judgment
- Lessons learned
- Cost analysis
- Life cycle cost analysis

Recognizing these sources, we looked at our project from beginning to end, trying to identify anything that might change, hinder, or affect our analysis (focusing mainly on assumptions, brainstorming, and expert judgment). Based largely on our country studies and our collective operational experience, we determined the following "what if?" topics as our primary risk concerns:

- *Support from Leadership*: What if the U.S. Government and/or U.S. Navy leadership fails to support the GFS concept or deployment of GFS platforms to troubled parts of the globe?
- *Geopolitical Relations (GFS – Gulf of Guinea)*: Fluctuating relationships with Gulf of Guinea countries. What if not all the countries in the Gulf of Guinea region are willing to participate in GFS due to an unfavorable relationship with the United States, or if the goals of GFS are not in-line with host countries goals?

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200. Harold Kerzner, *Project Management: A Systems Approach to Planning, Scheduling ,and Controlling* (New Jersey: John Wiley & Sons, Inc., 2006), 722-724.

- *Relations with NGOs*: What if the naval/military and civilian NGO personnel, administration practices, and general outlooks do not effectively mesh (sailors and civilians fail to work together in a united front)?
- *Interagency Relationships*: GFS is envisioned as a joint and/or interagency operation. What if traditional service boundaries and/or bureaucratic barriers prevent efficient cooperation?
- *Relations Between Host Nation and NGOs*: Many NGOs often operate without concern for political sensitivities, focusing on the human plights of populations – even if those populations comprise rebel camps. What if their efforts threaten the GFS mission?
- *Relations Between Host Nation and Inter-agencies*: What if interagency efforts threaten enhanced relations with host governments?
- *Peer Competition*: What if a peer competitor's influence in the region surpasses the U.S. influence and the peer competitor's priorities oppose that of the U.S.?
- *Operational Availability*: What if the operational availability of USN and USNS assets preclude use of the desired platform for the GFS mission for any number of reasons (FRP, number of desired class of platform limited in number, platforms called to respond to other operational requirements)?
- *Funding*: What if Congressional and Department of Defense funding cuts limit the ability of GFS to perform the missions set forth?
- *Increase in Threat Level*: What if the threat level in the area of operations (AO) increases?
- *Collateral Damage*: What if GFS actions result in friendly fire or collateral damage (should violent elements in the waters of host-countries demand the use of force)?
- *Multi-Tasking*: Risk of more than one simultaneous mission. GFS is in port; therefore it can not perform missions at sea.

Our second step was to *analyze* the previously identified risks in terms of their likelihood of occurrence, and resulting consequences. Such analysis can be based on, but is not limited to:[201]

- Analysis of plans and related documents
- Comparisons with similar systems
- Experience and interviewing
- Relevant lessens learned studies
- Specialist and expert judgments

The object here is to determine, "*If* [blank] happened, *then* the consequence would be [blank]." For example, in the case of our Operational Availability "what if," where operational demands elsewhere, or lack of inventory limit our alternatives for providing GFS platforms on station, *THEN* we might be forced to accept less than ideal platforms – or even delay or cancel GFS deployments. Consequences of other "what ifs" are included in the Risk Summary of Appendix E.

After this is completed, the *probability* and *impact* of the risks can be combined and categorized into risk ratings (low, medium, and high) and prioritized. This helps the decision makers to focus resources and attention to the greatest risk. A group of Subject Matter Experts, familiar with each risk area, is best qualified to determine risk ratings.[202] Figure 89 depicts our ratings:

201. Louis Simpleman, Paul McMahon, Bill Bahnmaier, Ken Evans, Jim Lloyd, *Risk Management Guide for Department of Defense Acquisition, Fifth Edition (version 2.0)* (Fort Belvoir: Defense Acquisition University, June 2003), 17.

202. Louis Simpleman, Paul McMahon, Bill Bahnmaier, Ken Evans, Jim Lloyd, *Risk Management Guide for Department of Defense Acquisition, Fifth Edition (version 2.0)* (Fort Belvoir: Defense Acquisition University, June 2003), 18.

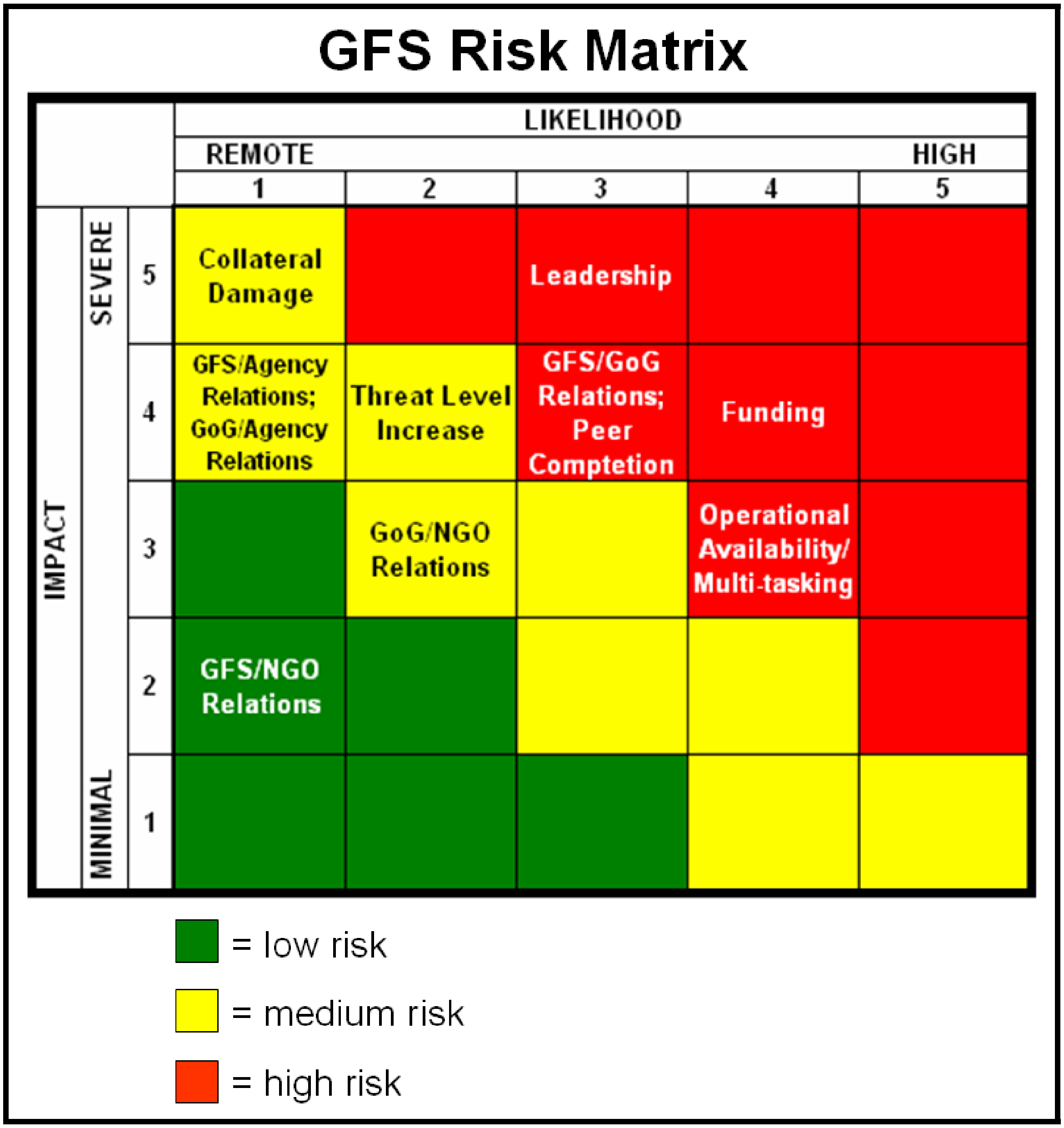

Figure 89: GFS Risk Matrix

What to assign as our red, green and yellow areas remained largely subjective, and rightly so: "programs should tailor the scales and the risk rating blocks to match their unique risk management requirements."[203] Here, we can see that risks related to funding,

[203]. Louis Simpleman, Paul McMahon, Bill Bahnmaier, Ken Evans, Jim Lloyd, *Risk Management Guide for Department of Defense Acquisition, Fifth Edition (version 2.0)* (Fort Belvoir: Defense Acquisition University, June 2003), 19.

operational availability, and fluctuating geopolitical relations demand the greatest attention, as they are the highest risk - comprised of greater likelihood and/or impact. Relations between the Navy and NGOs remained a low risk, while all others fell out somewhere in between low and high.

4. Risk Handling

We utilized *risk handling* to decide the method of reducing our identified risks, or to simply acknowledge their existence. The latter case recognizes that although *all* risks cannot be effectively reduced, they must at least be recognized by the decision maker as potential problems. The four ways to handle risk include:

- *Control.* Reducing or mitigating the risk by either lowering the probability or the impact of the occurrence.
- *Avoid.* Changing the concept, requirement, or specification by eliminating the source of a high risk and replace with a lower risk.
- *Assume.* Acknowledging the existence of a risk and make a conscious decision to accept that risk.
- *Transfer.* Re-allocating risk from one part of a system to another (risk sharing).

Therefore, in the case of our Operational Availability example, to mitigate the risk of not having our primary platform of choice available, we might best handle that situation by simply preparing a list of alternative platforms, platform modifications, and/or CONOPS, and implementing those contingencies. For example, should the MPF-E versions of MSC RORO ships become unavailable due to sealift requirements in another ocean, perhaps another pre-positioning ship could be utilized, or perhaps a couple of the Maritime Administration's (MARAD) Ready Reserve Force (RRF) ships could be activated to supplement current inventory. Means by which to handle other risks are included in the Risk Summary of Appendix E.

5. Results

Our risk analysis did not shape or influence our rankings of GFS alternatives out of current inventory; rather, it served as a reminder that all decisions must be made with risks considered. Doing so leads to contingency actions to mitigate the risks involved with GFS in a variable environment. See Appendix E for a summary of our analysis.

K. SUMMARY

We believed that we achieved three primary results from our FNA: a solution set of platforms from which to select GFS alternatives out of our fleet as it stands today, a gap - or gauge - by which to propose possible changes and innovations for future GFS concepts and platforms, as well as a set of contingency actions for GFS should our Navy encounter risks inherent to shaping and stability operations in the Gulf of Guinea. Our list of cost-effective ships certainly may provide a regional commander with the tools necessary to decide what platform he or she desires to serve as GFS in their area of operations – we must bear in mind that this tool emanates out of current capability. Indeed, many JCIDS studies end at this point, as the primary stakeholder or tasking authority may consider these results final. We also identified a gap, which was our original intention when we commenced FNA. This latter result would enable our next step in the JCIDS process: FSA. Finally, we considered the risks that might jeopardize GFS deployments, and developed a set actions we deemed plausible to maintain a persistent "force for good" in the Gulf of Guinea.

VI. FUNCTIONAL SOLUTION ANALYSIS

To recapture the purpose of FSA: "It is a joint assessment of potential DOTMLPF and policy approaches to solving, or at least mitigating, one or more of the capability gaps identified in the FNA."[204] To close the gaps of our FNA, we focused on four possible solutions: 1) the development of a new GFS class of ship, 2) applying doctrine, materiel, and personnel (DMP) changes to the platforms evaluated in FNA to improve their performance, 3) investigating possible solutions to improving cost for those alternatives, and 4) considering mission gaps in our scenarios and offering recommendations for future improvement.

A. NAVSEA PROPOSED NEW-CONSTRUCTION, GFS CLASS OF SHIPS

One method of closing the performance gap may lie in the construction of a new class of ship specifically tailored to the characteristics demanded by our attributes. Designing such a vessel remains beyond the scope of this study, but this subject may provide an excellent opportunity for follow-on studies for future SEA curriculums in tandem with other curriculums or agencies involved in naval architecture. However, we did obtain the opportunity to evaluate a future-concept notional design on a much more limited scale through our fortunate interaction with the NAVSEA 05D1/NACT GFS Team (Mr. Mark Campbell and Mr. John Krempasky).

1. Background

The NAVSEA 05D1 GFS Team applied their own JCIDS approach to the subject of GFS. As their task lied in developing a possible future-concept class of vessel for GFS, their study naturally focused more heavily on the FSA, and to a smaller extent on the FAA and FNA. As our study focused more heavily on the FAA and FNA, we hoped that working together might provide for a more complete JCIDS study. Though earlier coordination might have provided a means to tailor their ship solutions to our regional

204. U.S. Office of the Chairman of Joint Chiefs of Staff, *Operation of the Joint Capabilities Integration and Development System* (CJCSM 3170.01C) (Washington, DC: May 2007): A-14.

attributes, resulting in a truly integrated and comprehensive study, we did take advantage of constructive interaction between both studies with the limited time we had.

Meeting in Monterey in November of 2007, we were amazed at some of the similarities both groups shared in attempting to define GFS, determine the needs and missions, and in identifying pilot programs. Their identification of mission sets was strikingly similar to what we had determined as our missions: Training/Support (Theater Security Cooperation), Humanitarian, and GWOT-Related Kinetic missions. Clearly, they recognized the importance of a military-to-military, as well as a humanitarian element to GFS. Of course, our studies did not completely mirror each other. Their study derived several lessons from the USCGC Gentian's employment as a "Caribbean Support Tender" from 1999 to 2006 – a program that preceded and influenced the GFS concept – while our study had not considered that particular "pilot" in great detail. Mr. Campbell and Mr. Krempasky also emphasized that GFS, in their opinion, would be optimized if composed of (at minimum) two vessels: a "GFS Station Ship" and a GFS "Patrol Boat."[205]

2. Approach

Using the notional specs of what they envisioned for their future-concept "GFS Station Ship," we evaluated it using a "quick look" application of our FNA's weighting and scoring techniques. Since the concept-ship is notional, much of the data required in our FNA simply was not available, or was too generic to substitute directly into our calculations. In such cases, we used an analogous approach to compare what we were trying to measure with a known quantity from a similar vessel, or we interpolated based on the data we had. We also consulted cargo and vehicle capacity specs, as well as ship schematics produced and provided by the Center for Innovation in Ship Design (CISD), which is proposing design alternatives under the guidance of the NAVSEA 05D1 GFS Team. Of importance here is a recognition that with notional specs - vice more solid specs from completed designs or existing assets - the conclusions drawn from our method of determining a ship's performance as a GFS in the Gulf of Guinea is not necessarily a

205. Mark A. Campbell and John H. Krempasky (NAVSEA 05D1), *Ship and Craft Concepts to Support "Global Fleet Station,"* (powerpoint presentation given on November 6, 2007).

reflection of what the ship may be capable of when it reaches operational status. In addition, our evaluation, given the time constraints we faced when conducting it, were not as detailed as that conducted for our alternatives in FNA. With this in mind, we were interested to see how NAVSEA's future-concept ship might fare, given a "quick look" application of our weighting and scoring methods.

3. Notional Specs

The specs outlined in the following paragraphs were provided by Mr. Mark Campbell, of the NAVSEA 05D1 GFS Team.

GFS "Station Ship" – Notional Requirements

Guiding Note: Please note that all the specifications given here are *only notional*, as the analytical study to precisely identify ship mission requirements is an ongoing **FY08** task.

Overall Ship Characteristics:

Cost: Low cost is a *paramount* concern. Ship will be built to commercial standards.

Size: As a first-order approximation, we envision a ship size of 5,000 to 10,000 tons. It is anticipated that this will suffice to meet all the required missions, but some growth may be necessary. Note that since the GFS station ship is intended to be a "distributed" asset, a larger number of smaller vessels may be advantageous.

Draft:

- 15 ft or less. Important because many ports that the GFS ship will need to reach have limited depths.

- Beaching capability would be a plus.
- Capability to unload cargo at small/austere ports a definite requirement.

Speed: In this case, speed is neither essential nor particularly desirable. Accordingly, a notional top speed of 15 knots is specified, but this is subject to possible *modest* increase or decrease as operational requirements become better defined.

Endurance/Range: 6-12 month deployments, slowly moving in a given region, periodic visits to small/austere ports. Minimum 5,000 nm un-refueled range.

Fuels: Station ship to have ability to operate on a variety of locally-available diesel fuels. Some support of local navies and coast guards using mogas.

Stability: Commercial rather than USN stability standards if possible.

Operating Environment: Mainly coastal areas in hot/tropical climates.

Appearance: Unthreatening, non-military appearance.

Simplicity: Similarity/common systems to vessels operated by developing world countries would be beneficial. Limit use of classified systems, or restrict such systems to certain small areas, due to foreign crews being trained on board.

Aviation:

- Minimal requirement of Level 1 Class 1 (pad, hangar, full maintenance and fueling) for one H-60 class helicopter.
- Support for a number of UAVs.

Craft Support:

- Full support (fueling/maintenance) of ~ 4-8 patrol boats, (~ 50 ft to 150 ft size) (TBD). Smaller boats (11m-RHIBs) would be carried on board and deployed through cranes, well decks, etc. Larger craft would be supported by the GFS Station Ship.
- If GFS Station ship cannot be beached, a cargo connector to the beach may be necessary.

Crew:

- Accommodations for a base operating crew in the 30-50 range.
- Assume either entirely USN, or USN + foreign trainee crew (estimate foreign complement as 33%-50% of total crew, based on USCG *Gentian* experience). NOTE: crew accommodations will be based on USN berthing standards, *not* on MSC CIVMAR standards.
- Will often have State Department or Non-Governmental Organization personnel on board, thus several VIP cabins will likely be needed.
- VIP reception area for diplomatic events very desirable.

Armament:

- 1-4 gun mounts (7.62mm to 30mm) for self-defense; stabilized mounts are preferred (the USN-standard currently is the Mk 49 ROSAM, carrying up to 12.7mm, but GFS may require larger/heavier capability.)
- No CIC or equivalent capability required. The GFS station ship is NOT a combatant vessel!!

Communications:
Limited Communications suite – on the notional scale of the US Army Logistics Support Vessel, *NOT* a DDG or equivalent.

Modules: (Critical undetermined issue: Trade/offs between *inherent* capability and *modular* capability – TBD).

1) Capability to carry a number (TBD) of TEU or FEU modular mission packages with power and hotel services for the modules (Note these are NOT LCS mission packages). Likely more efficient to have enhanced power and hotel services be inherent in the ship (with built in inputs and outputs to modules) than in additional modules.

2) Some additional number of standard cargo ISO modules, or space for cargo for humanitarian relief, TBD.

Inherent OR Modular capabilities:

- Additional 20-100 mission personnel.
- Extensive medical facilities. (For notional planning purposes: 2 operating room / 8-10 bed facility(s).

- Substantial freshwater generation capacity (including at anchor in shallow/turbid coastal waters) and means of getting it ashore (for humanitarian relief).
- Briefing rooms/classrooms.
- Small boat simulator.

What NOT to Include:

- High speed neither required nor desired.
- Absolutely no need for signature reduction.
- No CONREP delivery equipment.

The following depiction of one GFS design proposal was provided by Mr. Simon "Matt" Howard of CISD, and with the concurrence of the NAVSEA 05D1 GFS Team. Please note that it is a *notional* idea of a design concept, and is subject to change.

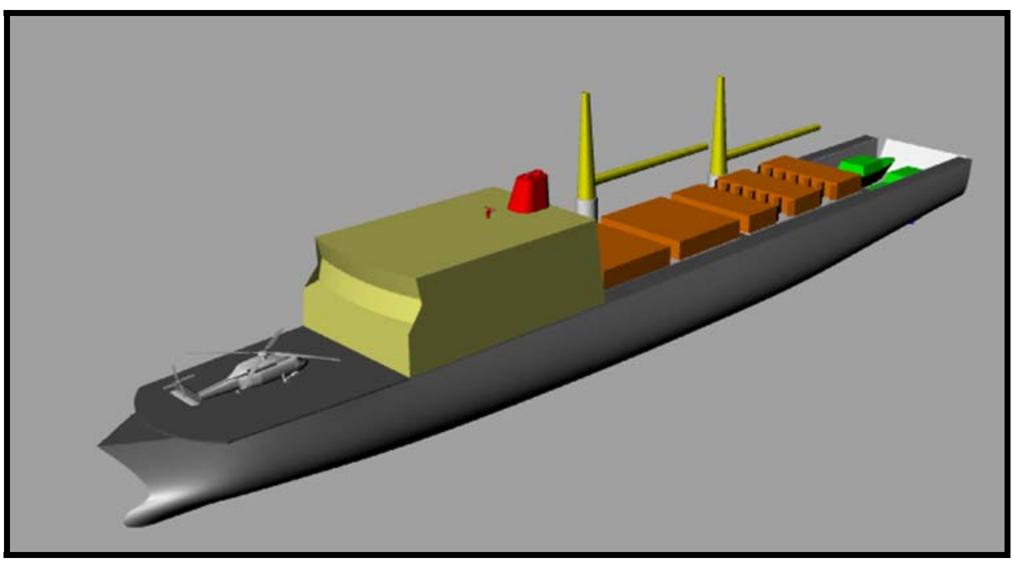

Figure 90: One Design Alternative for "GFS Station Ship"[206]

206. Simon Howard, Center for Innovation in Ship Design - Naval Surface Warfare Center, "Global Fleet Station CISD Concept," (powerpoint presentation given on November 9, 2007).

4. Attribute Outcomes

The following are general descriptions of how NAVSEA's notional GFS ship performed with regard to the attributes considered in our FNA. Weights assigned to attributes and mid-level functions in our FNA were not altered. Specific scores are provided in Figure 91, Figure 92 and Figure 93.

a. Peacetime Engagement

1.0 Peacetime Engagements: NAVSEA's ship will not have a CIC; limited command/control and communications, but should have similar capabilities as that of an AS. Therefore, the ability for the NAVSEA ship to provide RMSA or C3 resulted in a relatively low score.

1.1 Expanded Maritime Interception Operations: The NAVSEA vessel scores very high in this attribute since the ship will have the capability to carry 4-8 RHIB-like boats, and the necessary equipment and storage space to support these small boats. We assumed that it will possess an armory, as its specs include crew-served gun-mounts and associated ammunition. NAVSEA's vessel will also have a very capable and extensive medical facility, effectively addressing that aspect of our EMIO mission.

1.2 Maritime Security Operations and Cooperation (MSOC). NAVSEA's vessel is geared toward coastal operations; appears to be well suited for river support operations and fishery enforcement. In addition, the ship seems to be well armed for self protection; not so much in active pursuit of an enemy combatant or smuggler due to its relatively low speed of 15kts.

1.4 Foreign Navy Capability Building: NAVSEA's vessel seems well suited for foreign navy integration and interaction, as it will be constructed with an emphasis of embedding foreign personnel to conduct GFS PE/training missions.

Figure 91 summarizes the results for performance in the HA/DR mission, and details the scores in each attribute.

Peacetime Engagements				
Missions & Attributes	Weight within attribute	Weight		NAVSEA
1.0 Peacetime Engagements				
1.0.1 Command, Control, Coordination (C3)		8	Value Score	70%
			Weighted Score	6%
1.0.2 Regional Maritime Situational Awareness (RMSA)		8	Value Score	30%
			Weighted Score	3%
1.1 Expanded Maritime Interception Operations (EMIO)				
				4-6BOATS
1.1.1 Small Boat Operations Support		7	Value Score	100%
			Weighted Score	8%
1.1.2 Visit, Board, Search, Seizure (VBSS) Team Support		8	Value Score	100%
			Weighted Score	9%
1.1.3 Sea, Air, Land (SEAL) Team Support		5	Value Score	100%
			Weighted Score	5%
1.1.4 Equipment Storage		4	Value Score	100%
			Weighted Score	4%
1.1.5 Medical Support and Transport		4	Value Score	75%
			Weighted Score	3%
1.1.6 Detainee Coordination		6	Value Score	100%
			Weighted Score	7%
1.1.7 Helicopter Operations		7	Value Score	80%
			Weighted Score	6%
1.2 Maritime Security Operations and Cooperation (MSOC)				
1.2.1 Force Protection		5	Value Score	85%
			Weighted Score	5%
1.2.2 Ordnance on Target (Surface Warfare)		6	Value Score	80%
			Weighted Score	5%
1.2.3 Protection of SLOCs		3	Value Score	50%
			Weighted Score	2%
1.2.4 Riverine Operations		8	Value Score	90%
			Weighted Score	8%
1.2.5 Ocean/Hydro/River Survey & Support Operations		1	Value Score	100%
			Weighted Score	1%
1.2.6 Fisheries Protection		1	Value Score	100%
			Weighted Score	1%
1.3 Counter Piracy				
1.4 Foreign Navy Capability Building				
1.4.1 Training Ability		6	Value Score	100%
			Weighted Score	7%
1.4.2 Training Capacity		4	Value Score	100%
			Weighted Score	4%
				NAVSEA
Total Weighted Score		91		83.9%

Figure 91: P.E. Mission Total Value Calculations (GFS "Station Ship")

b. HA/DR

2.1 Infrastructure: In terms of resource and physical networks, NAVSEA's vessel seems well suited to provide these functions in a HA/DR scenario; especially if a natural disaster affected transportation infrastructure nodes such as harbors or airports. NAVSEA's vessel has the potential to beach ashore in the absence of port facilities – a characteristic which may prove valuable in an austere HA/DR environment.

2.2 Medical Assistance: NAVSEA's vessel will have the inherent capability of providing medical services, in addition to a potential modular capability, thus increasing their overall medical capabilities.

2.3 Logistics: NAVSEA's vessel provides a great way to conduct logistical operations in a HA/DR scenario. It does not need any ports to deliver and provide HA/DR services, as it can beach itself without damage to the ship. If the vessel does pull into port, its small draft will enable it to enter most West African ports. The vessel will also have inherent cargo moving equipment for a pier-side off-load.

2.4 Communications: NAVSEA's vessel will probably have the most basic communications equipment, comparable to that of a Submarine Tender. It will likely have enough gear to adequately conduct non-military types of communication support.

Figure 92 summarizes the results for performance in the HA/DR mission, and details the scores in each attribute.

				Global Weight	PCG of ATT Met
2.0 HUMANITARIAN ASSISTANCE/DISASTER RELIEF					
6	**2.1 INFRASTRUCTURE**				
	4	2.1.1 Resource Network		0.36	90%
	7	2.1.2 Physical Network		0.64	95%
			Total Value Score		93%
5	**2.2 MEDICAL ASSISTANCE**				
	6	2.2.1 Health Services		0.35	90%
	5	2.2.2 Plans and Operations		0.27	80%
	6	2.2.3 Medical Logistics		0.33	90%
	1	2.2.4 Administrative Services		0.05	100%
			Total Value Score		88%
6	**2.3 LOGISTICS**				
	6	2.3.1 SUPPLY		0.23	95%
	4	2.3.2 MAINTENANCE		0.14	95%
	8	2.3.3 TRANSPORTATION		0.30	90%
	4	2.3.4 CIVIL ENGINEERING		0.14	90%
	5	2.3.5 OTHER SERVICES		0.20	90%
			Total Value Score		92%
7	**2.4 COMMUNICATIONS**				
	9	2.4.1 Access Services		0.18	75%
	7	2.4.2 Voice Services		0.15	80%
	7	2.4.3 Data Services		0.15	80%
	7	2.4.4 Applications		0.14	100%
	6	2.4.5 Video Services		0.13	30%
	8	2.4.6 Satellite Communication Services		0.16	45%
	5	2.4.7 Communication Security		0.10	100%
			Total Value Score		72%
2.0 HUMANITARIAN ASSISTANCE/DISASTER RELIEF					
6	**2.1 INFRASTRUCTURE**			0.25	93%
5	**2.2 MEDICAL ASSISTANCE**			0.20	88%
6	**2.3 LOGISTICS**			0.24	92%
7	**2.4 COMMUNICATIONS**			0.31	72%
				NAVSEA	85%

Figure 92: HA/DR Mission Total Value Calculations and Results ("GFS Station Ship")

c. Inter-Agency/NGO Coordination

3.1 2nd Embassy: NAVSEA's vessel will most likely have enough communications gear and meeting/coordination spaces to adequately conduct the IA/NGO missions. IA/NGO missions will most likely utilize open-source/non-secure types of communications which the vessel will be equipped with.

3.2 Storage: First we considered the displacement of NAVSEA's notional vessel (5,000-10,000 tons), and contemplated correlating its relative displacement to that of an LHD to gauge its cargo capacity. Recognizing this as an excessively rough means by which to figure capacity, we sought more solid data. The Center for Innovation in Ship Design's concept ship for NAVSEA provides for 144,452 ft^3 of cargo space; 20,000ft^3 greater than an LHD has. The ship also has room for approximately three 5 ton vehicles and four HMMWVs[207], or ten HMMVWs, or ten Suburbans.[208] In both respects, this particular version of NAVSEA's notional ship performed this function extremely well.

3.4 Logistics: NAVSEA's vessel rates very high in this attribute area. The shallow draft and the potential to beach the craft allows this vessel a great off-load/on-load capability in virtually any type of logistic situation in the Gulf of Guinea region. In addition, it will also have the capability to conduct helicopter operations utilizing an embarked aircraft.

3.5 Minimize Militaristic Perception: NAVSEA's vessel is also very specific in building this vessel as non-militaristic as possible and constructing it to commercial standards vice military standards. Force posture will be minimized, providing just enough for self-protection at all in-port threat levels. We assumed a non-grey hull, and we deciphered the lack of a heavy "military" mast from CISD's rendering; therefore,

207. Simon Howard, Center for Innovation in Ship Design - Naval Surface Warfare Center, "Global Fleet Station CSID Concept," (powerpoint presentation given on November 29, 2007).

208. Simon Howard, e-mail to LCDR John Montonye, November 29, 2007.

NAVSEA's vessel achieved a maximum score for the appearance portion of this attribute.

Figure 93 summarizes the results for performance in the NGO & Interagency mission, and details the scores in each attribute.

3.0 Inter-Agency / NGO Coordination	Scenario Weight	Weight	Weight	Global Weight	NAVSEA
3.1 2nd Embassy:	2				
3.1.1 Coordination Center:		5		0.03	80%
3.1.2 Communicate Information:		7		0.04	75%
Total Value Score					77%
Total Scenario Value					5%
3.2 Storage of US Agency/NGO equipment:	9				
3.2.1 Storage:		10			76%
3.2.1.1 Cargo:			9	0.19	100%
3.2.1.2 Vehicles:			5	0.10	32%
Total Value Score					76%
Total Scenario Value					22%
3.3 Sustaining US Agency/NGO personnel (150):	5				
3.3.1 Messing:		10		0.09	100%
3.3.2 Berthing:		7		0.07	75%
Total Value Score					90%
Total Scenario Value					14%
3.4 Logistic support for US Agency/NGO personnel	10				
3.4.1 Transportation:		10			100%
3.4.1.1 Conduct LCAC Operations:			5	0.11	N/A
3.4.1.2 Provide Vertical Replenishment:			3	0.06	N/A
3.4.1.3 Provide Inport Replenishment:			7	0.15	100%
Total Value Score					100%
Total Scenario Value					32%
3.5 Minimize militaristic perception:	5				
3.5.1 Force Posture:		2		0.04	50%
3.5.2 Appearance		6			100%
3.5.2.1 Ship (Higher = less militaristic)			6	0.05	100%
3.5.2.2 Helo			5	0.04	N/A
3.5.2.3 LCAC			5	0.04	N/A
Attribute score					100%
Total Value Score					88%
Total Scenario Value					14%
				1.00	88%
		Overall			NAVSEA
		Performance			88%

Figure 93: Interagency/NGO Coordination Total Value Calculations and Results ("GFS Station Ship")

5. Results

Based on NAVSEA's notional idea for a ship specifically constructed for GFS, as well as our assumptions and methods of analysis, the results in Figure 94 demonstrate how that ship would perform in our three mission areas.

	P.E.	HA/DR	NGO
NAVSEA	84%	85%	88%

Figure 94: Mission Results ("GFS Station Ship")

Calculating our expected value in performance (EVP) from these scores, and considering the weights of each mission area, EVP = 85% for NAVSEA's notional GFS Station Ship alternative. The purpose of the following figure (Figure 95) is twofold. The first is to depict its performance, and the second is to highlight the ambiguous nature of its costs.

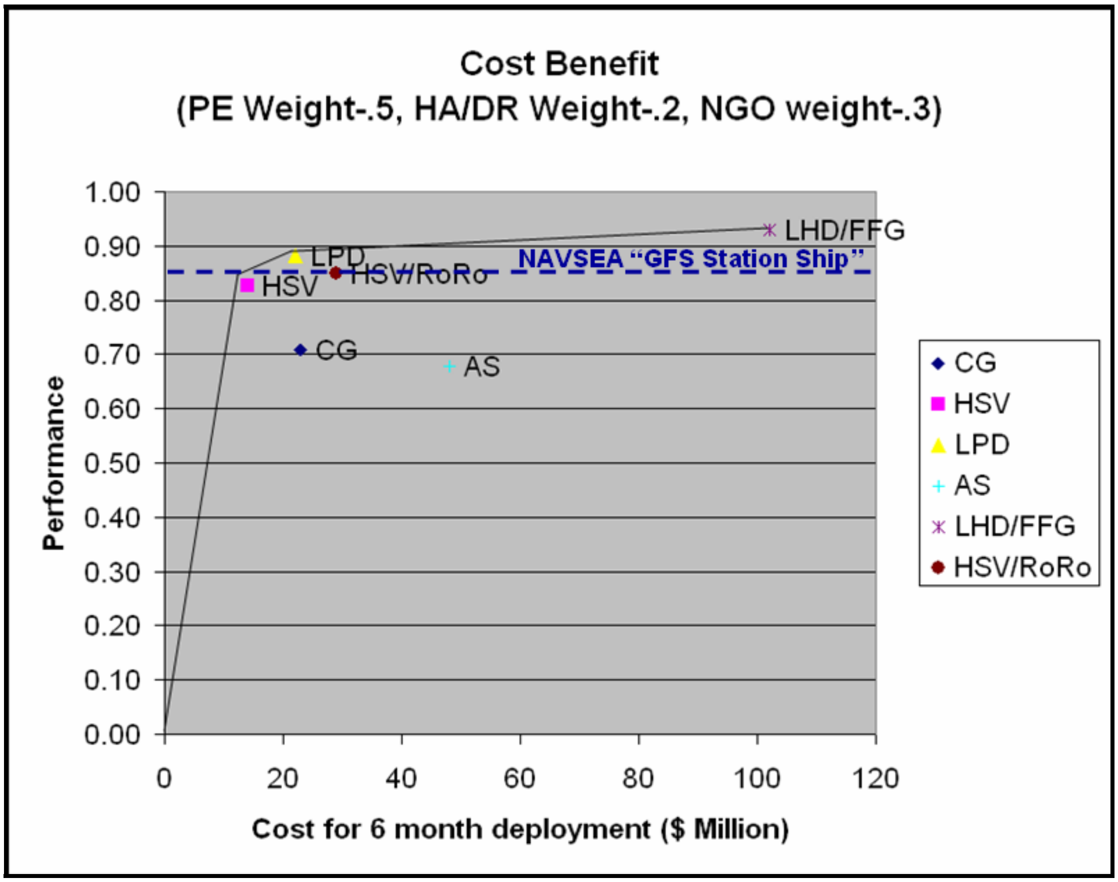

Figure 95: Performance and Unknown Cost of "GFS Station Ship"

a. Performance

GFS Station Ship's performance, as compared to our "current capability" alternatives, tied with the HSV/RORO combination for third highest in performance, and outperformed one of our top cost-effective platforms – the HSV.

One interpretation might be one of surprise: that the Station Ship – a ship specifically designed for GFS missions – did not rate first among our alternatives. We believed that such a translation, however, should be tempered by three considerations: 1) the NAVSEA GFS team envisions their Station Ship as only one piece of a complete GFS package, 2) the excess multi-purpose capability provided by the two grey-hulled amphibious options that outperformed it, as well as the risks and opportunity costs associated with such excess, and 3) differences between both groups' focus that influenced outcomes.

1) Adding the Second Element of the NAVSEA Team's GFS

Returning to the performance aspect of the NAVSEA team's notional concept, we then considered that it did not only include the "Station Ship," but also factored in a "GFS Patrol Craft." When factoring in a patrol craft, its presence improved scoring in the following Peacetime Engagement attributes:

- *1.2.2 Ordnance on Target*: score raised from 80% to 100%
- *1.2.3 Protection of SLOCs*: score raised from 50% to 100%
- *1.2.4 Riverine Operations*: score raised from 90% to 100%

Other attributes and mission areas were not considered to be altered by the addition of this asset. Of particular note, it did not alter the communications attributes across our mission sets - an attribute set that the Station Ship scored relatively low in. These improvements resulted in a Peacetime Engagement total value score of 87.7% for the GFS Station Ship & Patrol Craft combination package (Figure 96).

	P.E.	HA/DR	NGO
NAVSEA	88%	85%	88%

Figure 96: Mission Results ("GFS Station Ship & Patrol Craft")

Calculating our expected value in performance from these scores, and considering the weights of each mission area, EVP = 87% for NAVSEA's notional GFS Station Ship and Patrol Craft combination. Despite this improved performance, the NAVSEA notional combination package still ranked 1% lower in expected performance value than the LPD.

2) Another Look at the Top Performers

One might argue that the LPD and LHD outperformed the NAVSEA GFS Team's proposals simply out of their immense capacities for supplies, personnel, connector transportation, and multi-mission orientation. In addition, even if more capable of meeting the shaping and stability needs of the Gulf of Guinea, one might question the likelihood of pulling a national asset (LHD) out of the Navy's FRP, or of denying the Marine Corps one of their coveted transportation and sea-basing assets. This latter point was addressed by our Operational Risk assessment, which recommended "preparing a list of alternative platforms" (see Appendix E). In this case, the notional GFS Station Ship & Patrol Craft option would top the list for performance capability.

3) Differences of Opinion

One primary difference in emphasis between our group's study and that of Mr. Campbell and Mr. Krempasky dealt with the role of GFS in military-to-military cooperation. Our Peacetime Engagement focused on an active engagement by GFS in the security issues facing Gulf of Guinea nations, in large part due to a lack of naval capability on the part of several of those nations. The NAVSEA GFS Team focused on military-to-military cooperation in terms of training those nations' forces to confront their respective security challenges. This difference contributed to a large disparity between communications capability of their proposed vessel, and the capability

demanded by our communications attributes. Obviously, if we concurred with their emphasis on training vice active-engagement, their vessel would have achieved a better EVP.

b. Cost

Figure 95 is also intended to highlight a consideration sure to garner interest with regard to developing and operating a new class of ship: unknown cost.

The GFS Team stressed the point that their ship must be inexpensive to build and operate. On the latter point, they emphasized the importance of simple systems and modularity as key to low operating costs: "CHEAP and FLEXIBLE is crucial!"[209] Indeed, as we advocated factoring cost to all decision alternatives in our FNA, O&S costs are what regional/combatant commanders care about. With a new ship, however, R&D and production costs will be of great concern to the Navy. Understanding that the NAVSEA GFS Team intends to propose measures to reduce such costs, we believed that to attempt cost predictions - in order to determine cost-effectiveness of NAVSEA's ship - to be beyond the scope of this study.

B. APPLYING DMP SOLUTIONS TO FNA PLATFORMS

Out of the DOTMLPF construct, we applied the doctrine, materiel and personnel (or DMP) portions to the platform alternatives from our FNA. In our opinion, organization, training, leadership, and facilities aspects of the process held no substantive value in producing changes to effect improvements in performance of these assets. We looked at all platforms, and attempted to focus on changes that might effect the most noticeable increase to their total value performance scores in each mission area. In keeping with the FSA criteria to be "feasible with respect to policy, sustainment, personnel limitations, and technological risk,"[210] we also considered changes that might – even if not delivering noticeable impact in overall performance – be simple to change.

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209. Mark A. Campbell and John H. Krempasky (NAVSEA 05D1), Ship and Craft Concepts to Support "Global Fleet Station," (powerpoint presentation given on November 6, 2007).

210. U.S. Office of the Chairman of Joint Chiefs of Staff, *Operation of the Joint Capabilities Integration and Development System* (CJCSM 3170.01C) (Washington, DC: May 2007): A-14.

1. Solutions per Platform, per Mission

a. CG

The CG offered a basic, but not surprising insight into the CRUDES category of current capability: “not much room for change.”

- **Peacetime Engagement: No Change.** The CG scored the highest in this mission area without applying any improvements. The cruiser is designed and built for conducting PE missions and would not benefit from any changes to its DOTMLPF.
- **Interagency and NGO Coordination: No Change.** CRUDES sailors often boast that their ships “are built for war.” This credit is validated with the CG, as its spaces are full of combat systems dedicated to war-fighting, and leaving little in terms of space to lend for materiel changes in support of Interagency & NGO missions. In addition, we did not consider doctrinal changes viable, as these are coveted national assets in the Navy’s FRP. Applying any DOTMLPF solutions to this platform would not be cost-effective or feasible.
- **HA/DR: No Change.** Same reasons as provided for Interagency and NGO Coordination mission.

b. HSV

We were able to improve the HSV’s performance significantly in the humanitarian missions through application of DMP:

- **Peacetime Engagement: Original Score: 91%.** In order to bring the overall effectiveness up for this platform, we increased the ship’s capabilities to conduct C3/RMSA operations. Such combat effective improvements would include: improved military satellite communication suites, improved surface search radar, Link 11/16 capability, AIS, a more

dedicated and robust CIC space with SIPRNET access.[211] (Materiel) **New Score: 93%**

- **Interagency and NGO Coordination: Original Score: 72%.** One way to improve this score is to make the same materiel changes described above. The enhanced communications are needed to properly manage and coordinate NGO activities. Another possible improvement lies in the effective loading management of NGO cargo and vehicle capacity. (Materiel) **New Score: 88%.**
- **HA/DR: Original Score: 79%.** The HSV's internal spaces must be modified to increase the medical capacity and facilities of this platform. Such modifications would include support for medical staff to conduct major medical procedures. The HSV would need several operating rooms and tables, and hospital beds. The vessel's cargo deck can also be loaded with pre-fabricated medical modules that would tie-in to existing auxiliary services. These medical modules would increase the medical capacity and facilities of the HSV by providing operating tables and hospital beds for medical staff to work from. (Materiel, Personnel) **New Score: 88%.**

c. LPD-17

The LPD, considered one of our top alternatives for cost-effectiveness, and ranking second only to the LHD, did not have a lot of room for improvement, although we were able to propose some ideas that would provide improvements of some significance in the mission of Interagency and NGO Coordination mission:

- **Peacetime Engagement: Original Score: 96%.** Embarking Navy SH-60 aviation assets - more suited to the maritime tactical element than the troop transport and heavy lift capabilities of the USMC assets - would increase performance in the air tasks expected within the Peacetime Engagement realm. (Doctrine, Materiel, Personnel) **New score: 98%.**

211. Tactical Bulletin GWOT-06-02 Afloat Forward Staging Base for Maritime Security Operations From LSD and LPD Class Ships, March 2006.

- **Interagency and NGO Coordination: Original Score: 76%.** By optimizing the carrying requirements for NGO missions, the ship will be able to properly balance vehicles or cargo for the various organizations. (Doctrine) **New Score: 83%.**
- **HA/DR: Original Score: 87%.** Upgrading medical capabilities in a similar manner to that of the materiel changes proposed for the HSV will improve performance. Manning the ship with civilian mariners for jobs not tactical in nature may optimize manning, and free space for extra personnel and cargo for HA/DR efforts. (Materiel, Personnel) **New Score: 90%.**

d. AS

The AS stood to gain the most, performance-wise, out of our proposed DMP changes:

- **Peacetime Engagement: Original Score: 72%.** Adding C3 gear similar to that of a CG will significantly improve the ability for the AS to conduct RSMA and Command/Control missions, key functions for Peacetime Engagement. Replacing motor-whaleboats with RHIBS, along with the associated support/storage capabilities to support the RHIBS, will lift EMIO and Counter-Piracy performance. Adding operating tables and hospital beds will improve the medical component of this mission. Perhaps of greatest importance, and "easiest" to effect, would be the removal of stanchions around the helicopter pad, thereby making the AS capable of limited helicopter support. (Materiel) **New Score: 93%.**
- **Interagency and NGO Coordination: Original Score: 57%.** Adding C3 gear similar to that of a CG will significantly improve the ability for the AS to conduct NGO operations. Improving vehicle and cargo capacity, perhaps by modifying repair and storage spaces formerly consumed by submarine-tender duties, will help. (Doctrine, Materiel) **New Score: 68%.**

- **HA/DR: Original Score: 72%.** Modify internal spaces of AS to provide the necessary room to help facilitate resource/physical networks and support the personnel directly involved with the HA/DR missions (FAOs, Seabees, physicians, etc.). This might mean reducing manning of rates not inherently important to operations ashore. Adding C3 gear to the level of the HSV capabilities is viable, and desirable (Materiel, Personnel) **New Score: 87%.**

e. LHD/FFG

We only considered modifying LHD, as the FFG is comparable to the CG in its war-time focus, and scored very highly in the Peacetime Engagement mission, leaving little to gain from DMP changes.

- **Peacetime Engagement: No Change.**
- **Interagency and NGO Coordination: Original Score: No Change.**
- **HA/DR: Original Score: Old Score 92%.** Making Navy personnel experienced in civil engineering, construction and other HA/DR pertinent fields (along with associated equipment) a standard complement to the ship's crew would improve performance in this area. (Material, Personnel) **New Score: 94%**

f. HSV/RORO

New scores took into account the previous mentioned changes to the HSV; any changes mentioned in this paragraph are only to the RORO, and the scores reflect the changes with both.

- **Peacetime Engagement: Original Score: 85%.** We proposed adding crew served weapons with a security detachment on board, so the RORO had the capability to better conduct its own force protection. (Materiel) **New Score: 92%.**

- **NGO: Original Score: 90%.** Optimally balancing or reducing the amount of cargo/vehicles the RORO carries will reduce its draft, making it capable of entering more ports, thus permitting it to off-load and on-load equipment and supplies directly to the pier. (Doctrine) **New Score: 91%.**
- **HA/DR: Original Score: 82%.** By utilizing the RORO to carry the equipment and supplies in support of medical support and logistic services, the HSV will be freed to transport personnel and equipment ashore. C3 gear can be modified to work cohesively with the HSV**.** (Material, Doctrine) **New Score: 92%.**

2. Overall DMP Results

The following paragraphs and figures summarize our results.

From Figure 97, one can discern a marked increase in the AS platforms performance – some of this attributable to a very simple modification to their flight deck.

	PE(N)	PE(O)	HA/DR(N)	HA/DR(O)	NGON)	NGO(O)
CG	0.97	0.97	0.61	0.61	0.36	0.36
HSV	0.93	0.91	0.88	0.79	0.88	0.72
LPD	0.96	0.96	0.90	0.87	0.83	0.76
AS	0.93	0.72	0.87	0.76	0.68	0.57
LHD/FFG	0.97	0.97	0.94	0.92	0.86	0.86
HSV/RORO	0.92	0.85	0.92	0.80	0.91	0.87

(N): DOTMLPF Score (O): Original Platform Score

	Old EVP	Change	New EVP
CG	0.71	0	0.71
HSV	0.83	.08	0.91
LPD	0.88	.04	0.92
AS	0.68	.16	0.84
LHD/FFG	0.93	0	0.93
HSV/RORO	0.85	.06	0.91

Figure 97: Comparisons of Pre and Post-DMP Scores*

Figure 98 provides a visual representation of each platform's cost-effectiveness, following proposed DMP changes (Editor's Note: LPD PE(N) score should reflect a .98 score – this does not effect the overall new EVP of 92%).

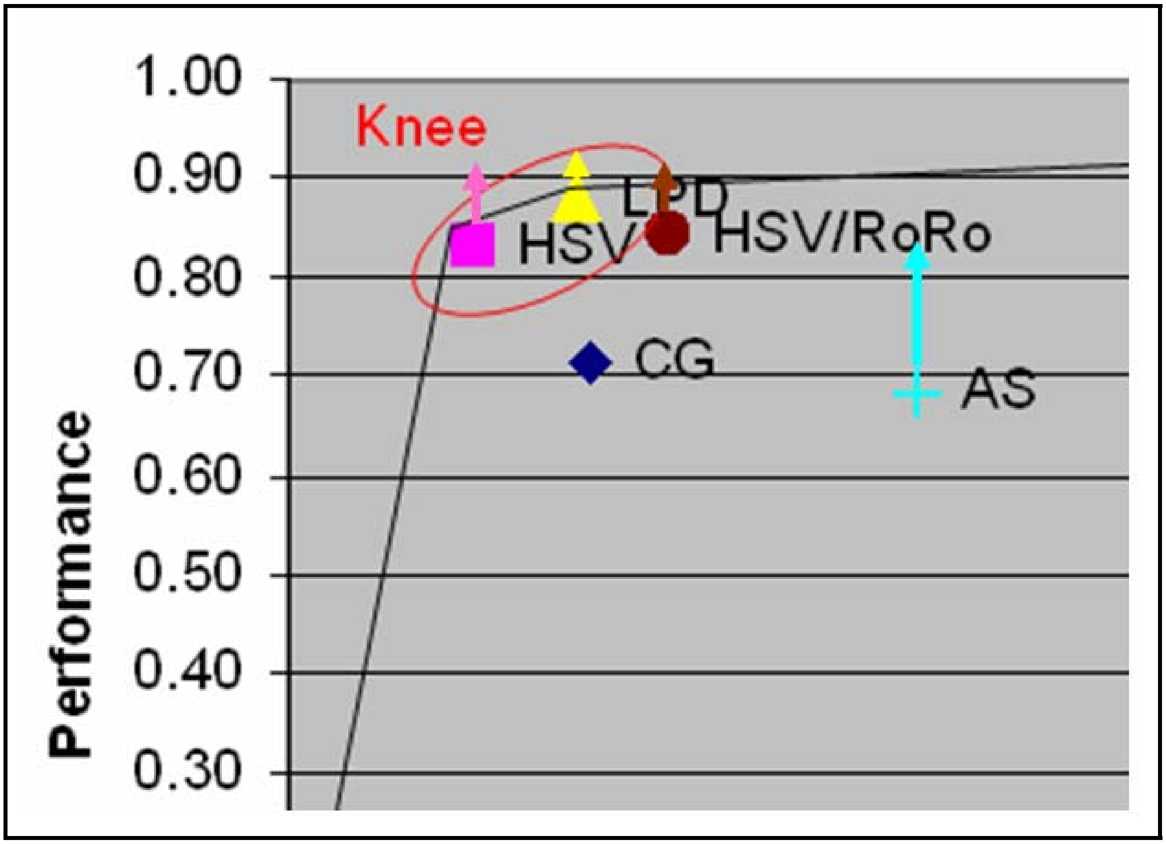

Figure 98: Focused Snapshot on Performance Improvement via DMP

Understanding that cost was not factored into the proposed changes, the increases in performance do bolster the HSV/RORO alternative's viability as a cost-effective option as it passes the "bend in the knee" of cost-effectiveness. The AS undergoes the greatest increase in performance through simple modifications, overtaking the CG, as well as the HSV (without modifications). In this evaluation, the LHD/FFG combination is still the highest performing platform, even though its overall EVP score did not change.

3. Key Takeaway: Some Common Threads Between Mission Attributes

Identifying some commonalities between performance deficiencies in all three GFS missions, we concluded that future DOTMLPF address of the following subject

areas may help the Navy close the performance gap with its current inventory of vessels in the GFS role for the Gulf of Guinea.

a. Communications.

Communication is common to all three mission areas. Indeed, the means to interact with personnel and assets beyond the immediate range via electronic means (voice, data, video) remains inherently important to any maritime operation. Though most of our current-capability platforms performed well in the communication attributes, the AS platform's relatively low score, along with the conclusions drawn from our NAVSEA interaction, highlight the need for a certain level of C3 capability in any platform we might propose. Apparently, that "line" appears somewhere above what the communications suite of an AS offers.

b. Connector Assets.

Helicopter and LCAC assets were also considered important to all three mission areas, with helicopters of paramount importance (note the dramatic performance increase for the AS after introducing a simple modification to their flight deck). A platform with the ability to inherently operate (and ideally house) helicopters provides a multitude of services from tactical (EMIO, Counter Piracy) for Peacetime Engagement, to logistical (medical, cargo, and personnel transfer) for HA/DR and Interagency & NGO Coordination. LCAC assets were not considered for the PE mission areas, but afforded a "heavy lift" connector capability which proved valuable to the NGO and HA/DR mission areas. LCACs provide a unique capability by allowing the transportation of personnel, equipment, and supplies to any of the Gulf of Guinea nations from the platform, whether into port or directly to shore. This latter point is especially crucial in situations where, for example, a natural disaster has eliminated previous harbor/port infrastructures or the area of operation is nowhere near a transportation node.

c. Cargo Capacity and Personnel Support.

All mission areas considered space for equipment/supplies, cargo/vehicle room, and the ability to carry and support the right people to conduct their respective

mission areas. In the Interagency & NGO Coordination and HA/DR realms, particularly, greater space affords increased flexibility and impact, as many of their efforts require primarily logistical support from GFS. Said simply, the more relief supplies the platform can bring, the more GFS can treat the affected people and sustain a longer relief operation. The ability to carry and sustain the right people for the mission is also a key attribute in conducting GFS tasks. GFS's value to the region increases when it can yield an optimal mix of personnel and equipment.

C. CLOSING THE COST GAP

Closing the performance gap only addresses the vertical component of our analysis of cost effectiveness. Indeed, DOTMLPF can be applied to closing the horizontal component: cost. As the core of our study relied heavily on the performance base of our attributes, however, so did our FSA – perhaps naturally so. With that said, we identified two methods – one doctrine related, and the other personnel related – of reducing cost. Both emanate from practices employed by MSC.

1. Maintenance

Condition based maintenance – a maintenance philosophy predicated on detection of maintenance needs followed by actual maintenance, rather than on periodic maintenance – promises to reduce maintenance costs, if employed. Such maintenance has been advocated for the DD(X) program:

> [Condition based maintenance] is expected to reduce non-corrective type maintenance and significantly reduce corrective maintenance induced by the planned maintenance system. In addition, routine maintenance … is projected to be reduced by increased equipment reliability and a strategy of replacing failed components on board rather than repairing them at sea.[212]

[212]. U.S. General Accounting Office, *Navy Options Needed to Optimize Ship Crew Size and Reduce Total Ownership Costs* (GAO-03-520) (Washington, DC: June 2003): 44.

Such a strategy contains direct cost benefits with its reduction in corrective maintenance requirements. Additional cost benefits may evolve more indirectly as a consequence of this strategy: maintaining station for longer periods of time as its needs to enter port due to corrective maintenance requirements dwindle, or mitigating the need for engineers and technicians who conduct the preventive maintenance (a personnel cost factor).

2. Civilian Manning

Personnel costs are the single greatest element in the operating costs of a vessel at sea (see Appendix D); therefore, they logically filter as one of the primary areas in which to search for cost-saving solutions. Manning GFS platforms with civilian mariners affords one such option.

> Use of Merchant Marines or Military Sealift Command personnel generally results in a smaller crew because these organizations employ more experienced seamen, have reduced watch-standing requirements, and use a different maintenance and training philosophy.[213]

Though we did not find the actual cost per person, we recognized that reduced manning by Navy sailors also equates to reduced costs. In a review of analysis regarding personnel-cost considerations with the JCC(X) Command Ship Program, the General Accounting Office (GAO) cited the following:

> The analysis found that using a mix of military and civilian personnel rather than all military personnel would reduce personnel costs by nearly a third, saving 2.3 billion for four ships over a 40-year service life.[214]

Such a proposal to man with civilian mariners, or a mix of civilian and military mariners has obvious implications regarding selection of a GFS platform, as it would effectively

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213. U.S. General Accounting Office, *Navy Options Needed to Optimize Ship Crew Size and Reduce Total Ownership Costs* (GAO-03-520) (Washington, DC: June 2003): 13.

214. U.S. General Accounting Office, *Navy Options Needed to Optimize Ship Crew Size and Reduce Total Ownership Costs* (GAO-03-520) (Washington, DC: June 2003): 17.

eliminate all CRUDES options, and possibly those options out of the Amphibious category. Though not the first time it has been considered, using civilian mariners aboard traditional grey-hull platforms, if implemented, would mark a major paradigm shift in the realm of doctrine and personnel. It would, however, *reduce cost*.

D. SCENARIO GAPS

To this point, our FSA offers possible solutions to closing performance and cost gaps in the traditional sense, but we also took the liberty of applying solutions to another type of gap: the missions and functions that "fell through" our study as a result of our stove-piped scenarios. Two of these include interaction with coalition partners (aside from host nations), and with the U.S. Coast Guard. In the case of the latter, missions and issues not thoroughly covered within our Peacetime Engagement scenario are addressed. Our "solutions" consist of a set of considerations and recommendations, which follow.

1. Coalition Support in GFS Operations

An important aspect not examined thoroughly within the scope of this study is the role of coalition forces in the deployment of a GFS. A GFS comprised of U.S. and coalition forces would be a valuable tool for Combatant Commanders (COCOM) based on its speed, flexibility, agility, and scalability to effectively respond to a variety of maritime safety and security requirements or regional crises. This combined capability has importance for COCOMs because small regional crises have the potential to erupt into large-scale humanitarian crises, border conflicts, pandemics, or interrupt the flow of vital resources to the U.S. or its allies. Integration of coalition partners into the GFS operational framework would clearly enhance the ability of U.S. forces to respond, not only to these regional crises, but more importantly provide an avenue in which to more effectively shape the hearts and minds of foreign governments and their populations around the world. Coalition forces, in particular, bring several unique advantages that the U.S. could and should consider in employing GFS, and include the sharing of operational expenses for GFS missions, providing a larger resource pool from which to match specific expertise and proficiency in meeting regional training requirements, leveraging existing relationships to garner regional awareness and influence, and a means to further

develop and enhance global maritime partnerships throughout the world. By leveraging the capabilities and existing relationships that coalition partners might possess within a specified region, a coalition GFS will be able to more able to effectively operate with and train regional forces, and thus significantly contribute to the region's collective security and prosperity.

There are coordination and planning issues, however, which must be considered prior to deploying coalition forces under the GFS umbrella. A combined GFS force could encounter resentment or ill-will towards particular coalition partners based on that particular nation's participation as a colonial power over countries within a specified region (an issue particularly applicable to the Gulf of Guinea). This lingering animosity or resentment between coalition partners and their former colonies could undermine or even restrict the overall success of these GFS missions. Therefore, planners must ensure (and be aware of) that any such impediments are harmoniously mitigated or resolved, prior to deploying a combined GFS force.

2. Military-to-Military Missions, and Interaction with the U.S. Coast Guard

Of the passel of issues that the authors of this study encountered over the course of our research and analysis, three topics in particular warrant further discussion in regard to the Peacetime Engagement mission area. The first of these are the legal aspects of GFS operations, for which we reference a paper by CAPT Mark Rosen, JAGC, USN (ret) of the Center for Naval Analysis (CNA). Legality has direct implications for the second topic – United States Coast Guard participation in Global Fleet Station, and finally, there are specific challenges to Regional Maritime Situational Awareness that we feel must be addressed.

a. Legal Issues

In his paper, *Legal Issues Associated with Green Water Craft Overseas Operations*, Captain Rosen proceeds from the notion that a forward-deployed Global Fleet Station "would provide indigenous support to Green Water Craft (GWC) vessels and serve as a launching pad for foreign operations." Among those operations, CAPT

Rosen addresses the legal aspects of Counter-piracy, EMIO, and International Training, all of which run congruent to our study. He scrutinizes each of the possible Global Fleet Station missions and identifies any relevant legal guidance, authority, or historical precedents.

We recommend a thorough consideration of Captain Rosen's paper, but for the sake of example we will discuss a couple of the major missions. In the first of these, Counter-piracy, it is the 1982 Law of the Sea (LOS) Convention that "acknowledges the right of warships to exercise the right to visit and, if appropriate circumstances are present, arrest vessels engaged in piracy or the slave trade." In this case, "there is no need for any new agreements [or] any host nation permissions or authorizations." Captain Rosen provides an excellent summary of the legal status and operational issues associated with different missions in Figure 99 below.

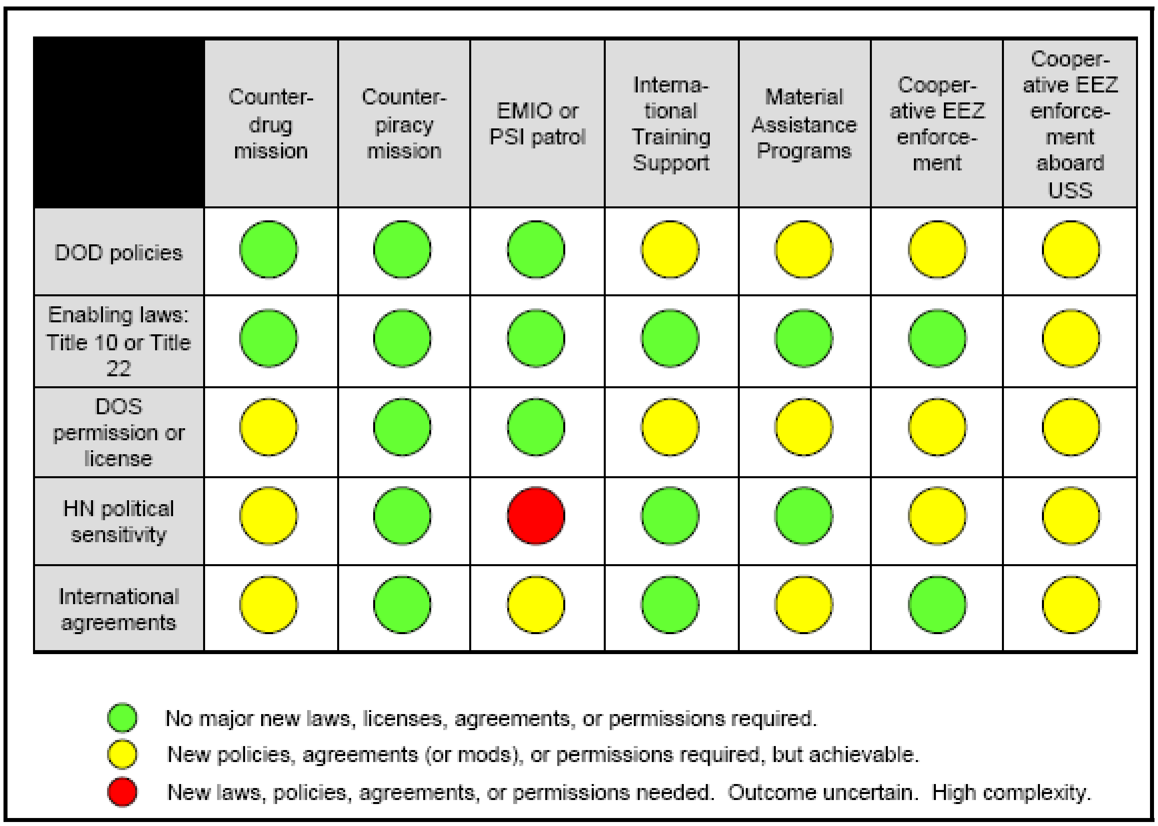

Figure 99: Operational Mission Evaluation Summary[215]

215. *Title 10 or Title 22* refers to the United States Code. Mark Rosen, "Legal Issues Associated with Green Water Craft Overseas Operations," *Center for Naval Analysis*, Aug 2007: 24.

He continues:

> Indeed, if the USN were to embark duly authorized law enforcement personnel from regional navies aboard GWC vessels, USN craft could serve as a law enforcement platform for their actions in much the same way that the Navy currently supports the U.S. Coast Guard in counter-drug operations.[216] Such enhanced type of enforcement would require coordination with the applicable coastal states and policy support from U.S. authorities.[217]

This recommendation has critical implications for cooperation with host nations as well as the incorporation of the United States Coast Guard into GFS. Global Expanded Maritime Interdiction Operations (EMIO) or Proliferation Security Initiative (PSI)[218] boardings are legally predicated on everything from consent of the ship's master to the Regional Enforcement Effort under Chapter VIII of the UN Charter. The point is that although DOD is not explicitly prohibited from helping a coastal state enforce its laws, it is only through the negotiation and subsequent enforcement of multilateral or bilateral agreements that a platform such as the GFS can truly be effective.

Nigerian Military Officer and Naval Postgraduate School student Ibrahim Sani recommends that "all participants get involved in the planning [for GFS]" and we, as GFS participants, should "try as much as possible to show that [we] are rendering support to the littoral navies to carry out their constitutional roles."[219] Although we've

216. The current process for Navy/USCG operations is for the USN commanding officer to hoist the USCG pennant in the midst of a counter-drug operation and then cede control of the law enforcement aspect to the embarked USCG law enforcement detachment. Article 92.1 of the LOS Convention states that ships may not change flags during a voyage nor display the flag of more than one sovereign state. The GWC or GFS could avoid these limitations by allowing host nation enforcement authorities to conduct their operation from properly flagged boarding craft or helicopters.

217. Mark Rosen, "Legal Issues Associated with Green Water Craft Overseas Operations," *Center for Naval Analysis*, Aug 2007: 13.

218. The Proliferation Security Initiative (PSI) is a global initiative aimed at stopping shipments of weapons of mass destruction (WMD), their delivery systems, and related materials worldwide, announced by President Bush May 31, 2003. It has been endorsed by many countries and is sustained through bilateral agreements with the United States. http://usinfo.state.gov/products/pubs/proliferation/#statement.

219. Ibrahim Sani, conversation with the authors, October 17, 2007.

reflected this in our Peacetime Engagement scenario, it's clear that one of the first places to start looking for legal rationale to support GFS operations is the constitutional authority within the host nations themselves. To that end we received some excellent input from CAPT Frank Ponds, Senior Naval Advisor to the Department of State (DOS):

> The role of the DOS is to engage the countries in question to assist DOD in determining the needs of the countries. This is often done through the embassies; through regional maritime security [MARSEC] initiatives and through the IMO [International Maritime Organization]. DOS is responsible under the National Strategy for Maritime Security to reach out to foreign countries and encourage them to embrace regional and international initiatives that will produce sound MARSEC principles and practices.[220]

The State Department's role is unquestionably essential to the GFS mission in laying the foundation for tailored operations and training. Indeed, from CAPT Ponds' comments, there are certain capacities for which DOS is uniquely equipped to lead the way – at least diplomatically – in GFS operations. We hear echoes of this call for indigenous planning and support in an assumption of Captain Rosen's analysis, albeit from a maritime perspective:

> A small ashore Naval Support Activity may need to be established to act as a permanent liaison to the local population and as a logistics coordinator and engagement planner in those locales like West Africa or Southeast Asia where there is no U.S. presence nearby. This activity could consist of a single liaison officer or one that is supported by a handful of host nation employees and/or enlisted personnel.[221]

In the same vein, one of Ibrahim Sani's staunchest recommendations was for the designation of a single point of contact in Nigeria with whom to communicate and from

[220]. CAPT Fernandez (Frank) Ponds, Senior Naval Advisor, Dept. of State, email to the authors June 6, 2007.

[221]. Mark Rosen, "Legal Issues Associated with Green Water Craft Overseas Operations," *Center for Naval Analysis*, Aug 2007: 5.

which to coordinate any and all interactions with the GFS. Clearly, there is a recurrent emphasis on - and need for - indigenous focal points that transcend the current functions of host nation embassies. He further advocates regional focal points: ones that "represent the entire region for easy coordination, [with] the various sub units of that focal point deployed along the regional coast."[222] Indeed, such regional centers for coordination, with dispersed assets at key points along the coast of the Gulf of Guinea, would greatly enhance missions such as MDA, and would also help facilitate coordination in security affairs between the West African nations. These platforms might be U.S., coalition, or West African partner assets; but certainly, such a proposal would encourage a multi-platform alternative.

One critical function of a host nation's focal point would be the identification of (and even campaigning for) funding sources available to a nation, a recommendation strongly espoused by Mr. Jeremy Cairl of the USCG's International Affairs division.[223] We contacted Mr. Cairl, who is responsible for training support to Europe and Africa, to further understand the complexities of USCG international training teams assigned to GFS. Funding for international training can originate from a handful of sources, from the International Military Education and Training (IMET) program[224] to the Secretary of Defense's Combatant Commanders Initiative Fund, which is authorized for use on joint exercises and military education and training to personnel of foreign countries. Notwithstanding considerable regulations upon material assistance, creativity may often be the key in securing funding for on-station training in countries with little to no history of cooperation with the U.S.

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[222] E-mail exchange between LCDR John Montonye and Captain Brian Hans (SEA-12), and COL Ibrahim Sani (Nigerian Army), 6 December, 2007.

[223] Jeremy Cairl, telephone conversation with the authors, October 30, 2007.

[224]. The IMET program is a low cost, key funding component of U.S. security assistance that provides training on a grant basis to students from allied and friendly nations. Authority for the IMET program is found pursuant to Chapter 5, part II, Foreign Assistance Act (FAA) 1961. Funding is appropriated from the International Affairs budget of the Department of State. U.S. Department of Defense, "IMET," Defense Security Cooperation Agency, http://www.dsca.osd.mil/Default.htm

b. Training

Not surprisingly, there is a specific process that the USCG must follow to respond to requests for use of the USCG's international training competencies. With its origin in the Defense Security Cooperation Agency (DSCA), the process consists of a detailed review of the requestor's needs, identification of funding sources, followed by a lengthy approval process for the curriculum and funding as well as development of a tailored training plan. Furthermore, USCG trainers are deployed as trainers only and cannot add to the operational contingent of a crew. The pros and cons of the division of operational and training expertise will not be discussed here.

However, narrowing down the ideal GFS training missions was a topic of some debate. That is, the merging of US maritime training capabilities with the particular needs of the GoG countries was not going to be seamless. We decided that a good starting point would be the training mission profiles of current and past GFS pilot programs. After reviewing an inbox full of documentation on each of those deployments, we compiled a list of training topics, but repeatedly found references to "Mil-to-Mil" training. We contacted the operations officer of the USS Ft McHenry, on her way to the GoG as the first Africa Partnership Station (APS), to discern what sort of activities and training topics were included under Mil-to-Mil training, as well as those responsible for the training. Mil-to-Mil has been used as a catch-all for ship rider training, seamanship and navigation, small arms, and even USMC martial arts training.[225] Figure 100 contains a comprehensive, but not exhaustive list of training topics and their respectively matched GoG country needs.

225. Gejuan Sweat, e-mail message to the authors, October 16, 2007.

	Training and Upgrades to Brown Water Navy	Counter-drug Trafficking	River Delta Security	Border Security & Dispute Resolution	Coastal Protection & Shipping Security	Offshore Exploration & EEZ Enforcement	Maritime Regime Building
Traditional USN "Mil-to-Mil" Training							
Ship Rider Training Program	■	■	■	■	■	■	■
Underway Operations	■	■	■	■	■	■	■
Seamanship and Navigation	■	■	■	■	■	■	■
Small Boat Coxswain	■	■	■	■	■	■	■
Small Arms Manual	■	■	■	■	■	■	■
USCG International Mobile Training & Education							
Maritime Law Enforcement (MLE) Boarding Officer Course	■	■	■	■	■	■	■
Maritime Operations Planning and Mgt Course	■						■
Port Physical Security/Port Vulnerability Course	■		■	■	■		■
Container Inspection Training and Assistance	■	■			■		■
Coastal Search & Rescue Operations	■				■		■
Basic Small Boat Operations	■	■	■	■	■	■	■
Basic Outboard Motor Maintenance	■						■
Coast Guard Development & Needs Assessment	■				■		■
Leadership and Management Course	■			■			■
Misc., Custom Designed for Host Nation	■	■	■	■	■	■	■
NECC Expeditionary Training Command (ETC)							
Riverine Operations	■		■				■
Naval Coastal Warfare	■			■	■		■
Port Security	■		■	■	■		■
NCO Professional Development	■						■
Control Craft Operation	■	■	■	■	■	■	■
Maintenance Management	■						■
Operational Risk Management	■						■
USMC Marine Expeditionary Team (MET)							
Marine Corps Martial Arts Program (MCMAP)	■						

■ = MATCH

Figure 100: Regional Needs and Core U.S. Training Competencies

Note that all USCG training courses are established and currently in execution, whereas the Navy's NECC Expeditionary Training Command (ETC) is relatively new and has yet to participate in GFS pilot programs.[226] Both are vast improvements over the USN's conventional method of bringing international students to CONUS for training.[227]

While the USCG is a vital partner in international training, it's in the Navy's interest to develop a core set of exportable international training competencies that complement those of the USCG. Naval Expeditionary Combat Command's recent stand-up of ETC[228] is a confident step in the right direction. While it may be more expensive for the USCG to conduct international training on its own (vice aboard GFS), it is even more cost-effective for those solutions to come from within the Navy.

c. Fisheries and EEZ Protection

As a possible training competency, one topic that came up frequently in the Gulf of Guinea country studies was that of fisheries regime enforcement or in larger terms, protection of exclusive economic zones (EEZ).[229] Identified as one of the primary country needs in Angola, Cameroon, Democratic Republic of Congo, and Sao Tome and Principe, fisheries protection is an attribute that received a low weight in our scenario but is no less important as a fulcrum for leveraging regional collaboration. We presumed that a "plug-and-play" international training team from the experts in fisheries enforcement – the United States Coast Guard – could be seamlessly incorporated into a GFS deployment. After all, other than enforcement of driftnet regulations, DOD is not

226. U.S. Coast Guard, "International Mobile Training & Education Catalog," http://www.uscg.mil/tcyorktown/international/itd/index.shtm

227. U.S. Department of the Navy, "International Training Center (NITC)," Naval Education and Training Security Assistance Field Activity (NETSAFA), https://www.netsafa.navy.mil/about.asp.

228. Emily Zamora, "NECC Establishes Expeditionary Training Command," *Navy.mil* (April 16, 2007), http://www.news.navy.mil/search/display.asp?story_id=28905.

229. The EEZ extends no more than 200nm from the maritime baseline of a country. The EEZ is only under the jurisdiction of the coastal state in matters relating to all resource and/or economic-related activity. A nation has control of all economic resources within its EEZ (but cannot regulate or prohibit passage or loitering above, on or under the surface - innocent or belligerent). Julia Voelker McQuaid et al., "Building a Maritime Safety and Security Force in the Gulf of Guinea," *Center for Naval Analysis*, June 2007: 11.

involved in fisheries enforcement, pollution control, or other EEZ control issues.[230] To learn more we instinctively turned to the USCG authority on the subject – LCDR Chris Barrows (Chief, Fisheries & Marine Protected Species Law Enforcement at USCG Headquarters) – and received somewhat of a wakeup call:

> First, there is a need for a viable fisheries management regime in place with clearly identified elements that necessitate fisheries enforcement - in other words, there needs to be something to train to. From a US Government perspective, assistance in the creation and/or validation of a fisheries management regime of relevance to a developing state falls under the purview of DOS and/or NOAA rather than the USCG. Once a management and legal regime is in place that can be enforced, specific fisheries enforcement training needs to be tailored to support the regime as well as be implemented in such a way as to ensure continued development and existence after the departure of a country team. A "train the trainer" concept is an important end state to achieve for this phase. In this regard, there is not necessarily a one size fits all approach to fisheries enforcement that will be applicable across several nations on a continent. Take the US model for instance. There are eight regional fishery management councils that each create their own semblance of regulations and requirements to manage fisheries in their geographic area of responsibility. Each of the councils has several fishery management plans that each have their own prohibitions and requirements for enforcement. Each region and regional fishery management plan requires a unique understanding and expertise for fisheries enforcement to be effective. That being said, there are elements of each fishery boarding which are common to any boarding at sea - force protection, embarkation, general vessel knowledge, general safety gear knowledge, use of force policy, defensive tactics, ship handing and outboard engine maintenance, and to some degree - potentially even gear identification. These are competencies that potentially the USCG can assist with exportable international training to help developing nations grow their fisheries enforcement capabilities.
>
> Additionally, the USCG's Fisheries Enforcement program does not organically have in its tool bag exportable international fisheries enforcement training teams - thus, support for the GFS concept outside of the CG's formal international training structure is currently unavailable. The USCG's mission is to enforce domestic living marine resource laws on US domestic vessels and foreign fishing vessels. The USCG's focus on the foreign fishing vessel/IUU [illegal, unregulated and unreported] threat

230. Mark Rosen, "Legal Issues Associated with Green Water Craft Overseas Operations," Center for Naval Analysis, Aug 2007: 19.

> is primarily organized to protect the US EEZ from illegal fishing by foreign fishing vessels as well as selective IUU fishing activities of particular interest to the US on the high seas (most effort in this arena is directed at North Pacific large scale high seas driftnet enforcement).[231]

International EEZ protection and fisheries regime enforcement now falls into an area of operations that offers tremendous opportunities for positive impacts in the global maritime arena. CAPT Rosen summarized it best:

> The fact that DOD has not been traditionally involved in these types of activities [fisheries] does not preclude GFS/GWC units from engaging in these types of activities with coastal states in the future. As is the case with counter-drug matters, the direct participation of DOD personnel in any apprehension or arrest of violators who would be prosecuted by the foreign coastal state would require policy clearance from the Secretary of Defense and, perhaps, the Secretary of State. […] it seems rather clear that GWC could engage in joint patrols, conduct limited types of detection and monitoring operations in collaboration with coastal navies or coast guards, and provide certain types of training. And, even though this type of activity may be moving out of the Navy's normal "comfort zone," this type of collaborative activity should be given close attention because this activity is much more likely than any of the collaborative activities discussed in this paper to have a positive impact on the security and economy of the host nation and endear the GWC to the local inhabitants.[232]

d. Regional Maritime Situational Awareness

Another fundamental capability of GFS that necessitates collaboration with USCG, DOS, and host nations is Regional Maritime Situational Awareness (RMSA), or Maritime Domain Awareness (MDA) as it is popularly called. DOS "works closely with DoD to develop mechanisms by which we can improve maritime domain awareness…simply put the authority and ability to share information and intelligence that presents a clear picture of the maritime environment for countries to react and respond

[231]. Christopher Barrows (USCG HQ), e-mail to Capt. Brian Hans (SEA-12) on October 23, 2007.

[232]. Mark Rosen, "Legal Issues Associated with Green Water Craft Overseas Operations," *Center for Naval Analysis*, Aug 2007: 20.

to. It could be as simple as contact management or complex as intelligence gathering and sharing.[233] Where the Coast Guard is concerned, Secretary of the Navy Donald C. Winter tells us of "the value of the Automatic Identification System in terms of safety, information exchange, and navigation assistance. In many ways, AIS is an extension of what has already been done with airspace, conferring benefits to all participating nations. With Maritime Domain Awareness, we are seeing more and more nations willing to cooperate, sharing information that is in the interest of all who participate in this global tracking system."[234] However, when it comes to something as specific as data sharing, LCDR Brent West of the National Reconnaissance Office warns us of a common, yet easily avoidable obstacle:

> There are literally a hundred different [data] fusion engines being used by different organizations around the world....everyone seem to have their own special fusion engine, and most people don't want to have to learn how to use a new one. So it's a challenge to improve MDA when people are requiring information to be tailored and formatted specifically for them. I believe there could be enhanced communication, collaboration, and overall better MDA if the means of data sharing improved. We need to create new methods of providing information in common standards so that anyone, anywhere, can access the data. It's not about creating a new fusion engine, but rather it's all about fusing as much data as possible in whatever fusion engine the many different people are using. I have seen first-hand how using multiple sources of data has improved the MDA picture.[235]

As an attribute, RMSA was inherently difficult to quantify and evaluate, however it's the one for which we were able to create a simulation – at least in terms of monitoring and detection. There are literally thousands of different networks, relationships, organizations, communications, sensors, and data management systems that contribute to Regional Maritime Situational Awareness and it is best left as an overarching concept to

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233. CAPT Fernandez "Frank" Ponds, Senior Naval Advisor, email to the authors June 6, 2007.

234. Donald C. Winter, Current Strategy Forum (CSF) Keynote Speech, June 12, 2007, http://www.navy.mil/navydata/people/secnav/winter/070612_current_strategy_forum.pdf.

235. Brent West, email message to the authors, November 20, 2007.

be included in system design rather than a specification to *design to.* That is what we have striven for in our study.

E. FSA SUMMARY

When we started our studies, we conceived the idea that our systems process would lead us to a single, detailed, and concise solution to the challenge of determining what GFS *should be*. As our FSA has illustrated, however, our solutions are as complex as the issues GFS is intended to address. Our top solutions emanate out of our FNA, as applying DMP to them did not affect their relative ranking as the most effective alternatives for GFS: the HSV and the LPD-17. However, the AS stands as the "most improved" platform via helicopter-connector and communication changes, and in this case, DMP did affect relative standing, and highlighted how its application might make some ships suitable system alternatives for GFS. If we were to extend our timeline to the year 2028, however, and assume that FRP requirements steal our LHD/FFG package, then the NAVSEA GFS Team's Station Ship might produce the most desirable alternative – pending life-cycle costs, of course. In addition, not all solutions are materiel, doctrine, or personnel related; some just deserve attention, like coalition and Coast Guard integration and interaction.

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VII. IN SUMMARY

A. RECAPTURING THE PROCESS

In applying a systems approach to GFS, SEA-12 confronted what many might consider a non-engineering subject. Frustrated at first by this seemingly grey area where an engineering method collides with the socio-economic-political and policy related realm of shaping and stability, as well as by the lack of a specific system requirement, we "took charge" by determining that requirement in the forms of a definition and a problem statement – both of which were gleaned out of a broad literature research effort. These two key items not only served to provide boundaries to our study, but were in fact our first personal "stamp" on the GFS concept.

We selected the JCIDS model as our approach method, due to its wide use within the Department of Defense, and due to phases within it that are reflective of systems engineering fundamentals.

We selected a particular region – the Gulf of Guinea – in order to scope our project, but even more importantly, we did so out of the desire to propose a system alternative that would truly make an impact not only for the U.S., but for the nations and people whom we hoped to interact with in the name of stability. We wanted GFS to be recognized throughout the region as "a force for good," just as the CNO had stated. Taking the "user" into account, this desire added another dimension to our JCIDS process: Value Engineering.

Through more detailed research into our Strategic Guidance, we came to understand the reasoning behind what we had initially conceived as grandiose discussion about this thing called Global fleet Station; indeed, it provided us with specific detail that we could later apply as requirements for GFS. In addition, it validated our definition and problem statement for us.

In FAA, we identified the needs of the Gulf of Guinea through more literature research. We attacked the stability issues in the region with a three-pronged, mission oriented attack, breaking the cohort into three teams: Peacetime Engagement, HA/DR, and Interagency & NGO Coordination. These teams addressed issues in the region

functional, mission, and capability hierarchies within their own respective missions, while the Interagency & NGO team acted dually as our Country Team, checking the viability and validity of the mission teams' hierarchies to the region, while providing the value base that we desired. Out of these hierarchies, we determined specific capabilities GFS should have to address the issues identified. We called these specific capabilities attributes, and they were our means of deriving quantitative and/or subjective measures by which to determine system alternatives. Our attributes provided the key to passing from the qualitative world of regional stability, into the quantitative world of engineering and analysis.

In FNA, we identified the gaps between what our attributes called for, and what the "current capability" of our fleet provides. We first determined what current capability consisted of by deciding that it would be a seaborne platform – or ship – and then selecting six ship alternatives via a Nominal Group Technique, including two composed of multiple ships. We applied regionally pertinent scenarios for each mission team as a means of offering a realistic context by which to evaluate GFS system alternatives, and determine how well they performed in meeting our set of attributes in those scenario environments. We recognized that this "stove-piped" scenario did have scenario "gaps" of its own, and we addressed them through sensitivity analysis in some cases, as well implementing horizontal quality assurance practices across all the mission areas. Out of these scenarios, we were able to determine performance "total value scores" for each ship, in each mission. Applying a decision matrix for "decisions made under assumed risk," we were able to determine relative "expected value performance" scores for each of our alternatives as a GFS in the Gulf of Guinea. We then "filtered" these outcomes through the mitigating factor of cost, thereby determining our most cost-effective alternatives: the LPD-17 and HAS alternatives. We also applied risk analysis, and provided contingency actions for a host of possible risks of deploying a GFS to the Gulf of Guinea.

In our FSA, we evaluated two primary approaches to "closing the gap" identified in FNA, by analysis of a future-concept design by the NAVSEA GFS Team, and by applying conceivable doctrine, materiel, and personnel changes to our current-capability

platforms. NAVSEA's notional GFS Station Ship performed well, and when combined with a PC, it ranked just below the LPD in performance. However, we were unable to apply any cost analysis to it, and also recognized that our expected values for performance with this vessel were based on *notional*, and sometimes very general data; therefore, we recognize that our evaluation of this vessel was rough. Applying DMP to our FNA "champions," we determined viable methods to increase performance on almost all platforms; however, their relative ranks in performance did not change. We also considered possible means by which to close the cost-gap, by exploring personnel and maintenance methods used by MSC. Finally, we addressed means in which to close our "scenario gaps," exploring possibilities in coalition and Coast Guard integration and interaction.

B. PROJECT RESULTS

1. The Process: FAA's "Process Model," and "Real World" Application of Our FNA

One major result of our project was the process itself. In FAA, we identified a process by which regional commanders can utilize a "global 'process model'" of mission, functional and capability hierarchies applicable worldwide, and apply regional studies to determining which mid-level functions, missions and capabilities apply. Out of this set of regionally applicable mid-level hierarchies, the attributes may be determined, and various platform alternatives tested against them using comprehensive scenarios to determine what assets to engage in regional shaping and stability operations.

In addition, we considered different types of decision making, and also analyzed different weights to our mission areas, understanding that not all COCOMs may consider our three mission areas as relatively important as we did to our specific region of focus. Interested in if the outcomes might change significantly, we applied what we gauged as Commander, Naval Forces Europe's emphasis on mission importance to our process in FNA, and were surprised to find that the results for cost-effective platforms out of our list of current alternatives did not change, with the LPD and HSV still leading. Though not applying CNE's specific outlook to our study throughout (this was *our* study), we did

enjoy the opportunity to apply a facet of our process to "their" decision-making (See Appendix F).

2. Cost-Effective Alternatives from Current Inventory: LPD and HSV

Perhaps the most tangible result of our study was an affirmation of the HSV as a cost-effective GFS alternative. Though we had considered fleet commander's pilot programs as ad hoc, the platform employed in the past and proposed for the future by both SOUTHCOM and CNE, respectively, achieved on of our top ranks in performance and cost. The LPD-17 was our most cost-effective choice from current inventory.

Of course, the subjective nature of our study must be considered before extraordinary weight is placed into these findings. Not conducive to simulation, our project relegated most scoring to subjective measures. We were unable to approach any normalized results or to conduct regression analysis since we could not repeat our scoring without simulation tools – or other groups – to repeat our efforts. The subjective nature of our study relegated us to a one-time result, without a standard error or deviation; therefore, our results are understandably … subjective.

3. NAVSEA Concept Ship Performed Well; Unable to Predict Cost

Limited time to interact with NAVSEA, the notional nature of their conceptual GFS ship, and some disagreements on attribute scores and weights between SEA-12 and the NAVSEA Team must be considered - in addition to the concerns listed in the preceding paragraph – before considerable weight is applied to our assessment of their proposal. With that said, it did perform admirably, performing in the vicinity of our most cost-effective alternatives, and if the FRP were to dictate that an LPD were not an option, we envision their ship as a top-rate alternative. We were unable to apply cost measures to this platform.

4. Effect on Alternatives' Ranks by DMP; Important Attributes Identified

With one exception, applying DMP to our current alternatives had little effect on their relative rankings; however, DMP modifications did influence moderate to major

performance increases for most of the vessels. The best example was that of the AS: if stanchions are removed from the flight deck to re-certify it, and changes are made to its communications suite, its performance increases dramatically. Its new helicopter capability fulfills several attributes, and makes the AS a viable GFS asset with some relatively "simple" changes. In addition, we identified three attribute areas shared by all mission areas, which can greatly influence how a vessel performs as a GFS in the Gulf of Guinea: 1) Communications, 2) Connector Assets, and 3) Cargo Capacity and Personnel Support.

C. ONE FINAL RESULT

Perhaps the greatest value of this project is the knowledge that we effectively applied a systems process to a broad topic dealing with people, governments, and geography – and determined results that may receive application toward peace and stability in places where the populations cling to the hope of such aspirations.

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APPENDIX A: COUNTRY STUDY

A. AN ANALYSIS OF LIBERIA

1. Geography[236]

Total Area:	111,369 sq. km. (43,000 sq. mi.). Slightly larger than Ohio.
Ports:	Monrovia, Buchanan, Greenville, and Harper
Coastal Features:	579 km (359.77 mi.) Mangrove swamps populate the coastal region
Climate:	Tropical climate, hot and humid.
Major Cities:	Monrovia, Buchanan, Gbarnga, Kakata, Harbel.

Liberia's flat coastal region rises to a tropical rainforest in the interior. Liberia is home to 40% of West Africa's rainforest.[237] Deforestation is a major environmental issue in country. Despite having four major ports, only Monrovia is utilized for commercial shipping, the others are used for logging.[238]

2. Economy[239]

GDP (2006):	$902.9 million
GDP growth rate (2006):	7.8%
GDP per Capita (2006)	$900
Natural Resources:	Iron ore, timber, diamonds, gold, hydropower

236. The World Fact book, "Liberia," U.S. Central Intelligence Agency, https://www.cia.gov/library/publications/the-world-factbook/geos/to.html.

237. Bureau of African Affairs, "Background Note: Liberia," U.S. Department of State, http://www.state.gov/r/pa/ei/bgn/6618.htm.

238. OT Africa Line, "Liberia," http://www.otal.com/liberia/index.htm.

239. The World Fact book, "Liberia," U.S. Central Intelligence Agency, https://www.cia.gov/library/publications/the-world-factbook/geos/to.html.

Agriculture (2002):	76.9% of GDP, Products: coffee, cocoa, sugarcane, rice, cassava, palm oil, bananas, plantains, citrus, pineapple, sweet potatoes, corn, and vegetables.
Industry (2002):	5.4% of GDP
Services (2002):	17.8% of GDP
Trade (2004):	Exports: rubber, timber, iron, diamonds, cocoa, coffee
Major Markets:	Germany, Poland, U.S., Greece
Imports:	fuels, chemicals, machinery, transportation equipment, manufactured goods; foodstuffs
Major Suppliers:	South Korea, Singapore, Japan, China

Liberia's economy is still in shambles after the civil war. Prior to it, Liberia was a premier iron ore mining and natural rubber producing country. However, UN sanctions banning timber and diamond exports reduced an always shrinking economy even more. Those sanctions have just recently been lifted. Timber exports have not returned to large scale results, and the diamond sanction was lifted in April 2007. Therefore, diamond exports are in the beginning phases. With a new relatively stable political situation (enforced by the UN) foreign investors are returning to Liberia. Economic activity should increase greatly within the next few years. Liberia's main form of income currently in due to its' maritime shipping registry, it has the second largest maritime registry in the world. It brings in 15 million dollars annually.[240] A leading contributor to economic struggles is the 80% unemployment rate.[241]

240. Bureau of African Affairs, "Background Note: Liberia," U.S. Department of State, http://www.state.gov/r/pa/ei/bgn/6618.htm.

241. Bureau of African Affairs, "Background Note: Liberia," U.S. Department of State, http://www.state.gov/r/pa/ei/bgn/6618.htm.

3. Political[242]

Government Type:	Republic, lead by president elected for a six year term. The president is head of state, head of government, and commander in chief of armed forces.
Structure:	Consists of a President, 30 seat Senate, 64 member House of Representatives, and Supreme Court
U.S. Relations:	U.S. - Liberia relations are strong and close.

Liberia's foreign relations have been troubled as expected, as the country has gone through civil war. However, Liberia now has good diplomatic relations with the United States, Cuba, China, and Libya. Liberia is an active member of all major international alliances; UN, ECOWAS, AU. The United States in the biggest monetary contributor to the reconstruction of Liberia contributing over 1 Billion dollars already, with more than 200 million committed for 2007 and 2008.[243]

4. Social[244]

Religion:	40% Christian, 20% Muslim, 40% Other
Population:	3,195,931 (2007)
Literacy rate (2000):	57.5%
Health:	Infant mortality rate (2007) 14.9%, Life expectancy (2007) 40 years, AIDS rate 5.9% (2003)
Work Force:	Agriculture 70%, Industry 15%, Services 2%

Liberia is an English speaking, primarily Christian nation. It was founded by free African Americans and freed slaves in 1820. They settled in what is now Monrovia (named after former United States president James Monroe). Liberia is in the process of

242. The World Fact book, "Liberia," U.S. Central Intelligence Agency, https://www.cia.gov/library/publications/the-world-factbook/geos/to.html.

243. Bureau of African Affairs, "Background Note: Liberia," U.S. Department of State, http://www.state.gov/r/pa/ei/bgn/6618.htm.

244. The World Fact book, "Liberia," U.S. Central Intelligence Agency, https://www.cia.gov/library/publications/the-world-factbook/geos/to.html.

recovering from a 14 year civil war which destroyed many of Liberia's businesses, dismantled the infrastructure, and crippled economic stability and viability. Prior to the civil war Liberia was a country steeped in American customs and values; especially politically. Its' government and constitution was based on the United States. This would prove costly, as in the United States only the elite had voting rights. They monopolized political power in the country. This would last until 1980 when an indigenous person Master Sergeant Samuel K. Doe, seized power in a coup d'etat. His rise to power would be the catalyst to the 14 year civil war that has left Liberia in a state of disrepair.

5. Transnational Issues

The majority of transnational issues facing Liberia stem from the number of people displaced during their civil war. There are Liberian refugees living in a number of neighboring states. Economic futility has limited much transnational interaction. As a result of limited transnational interaction, the numbers of transnational issues are few. Stability within the country is being backed and solidified by a large contingent of UN peacekeeping forces, who have been in country since 2003. Although, peace has been declared since 2003, it has not stopped subversive persons and groups from planning means to unseat the current government. In July 2007, the government of Liberia charged two men with treason. The government is charging former Acting Speaker of the National Transitional Government of Liberia (NTLA), George Koukou and the retired Armed Forces of Liberia (AFL) General Charles Julu with "without any color of right or legal justification and with wicked and criminal mind, connived, conspired with some unknown persons to subvert and overthrow the legitimate government of Madam Ellen Johnson Sirleaf."[245] The charges demonstrate the thin line in which the current government operates.

Cote d'Ivoire accuses Liberia of supporting Ivorian rebels, a statement Liberia denies. Cote d'Ivoirian refugees are taking shelter in Liberia.

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245. D. Webster Cassell and Charles Yates, "Liberia: Julu, Koukou Charged," *The Inquirer*, http://allafrica.com/stories/200707240874.html.

6. Needs Summary

- Total Infrastructure rebuilding (roadways, water, electricity)
- Education
- Employment Opportunities
- Political Stability

B. AN ANALYSIS OF COTE D'IVOIRE

1. Geography[246]

Total Area:	322,500 sq. km. (124,500 sq. mi.); slightly larger than New Mexico.
Ports:	Abidjan, Aboisso, Dabou, San-Pedro
Coastal Features:	515 km (320 mi.) of coastline; Coast has heavy surf and no natural harbors.
Climate:	Tropical; hot and humid in SW, hot and dry in N, warm and dry on Eastern Coast; rainy seasons May – June& August – September
Major Cities:	Yamoussoukro**,** Abidjan, Bouake, Daloa, Gagnoa, Korhogo, Man, San Pedro

Cote d'Ivoire is subject to flooding during the rainy season. The port of Abidjan is the largest port between Casablanca and Cape Town, and prior to governmental instability it was the most modern and one of the busiest in West Africa. Recently, efforts have been made to regain lost shipping. Although Yamoussoukro is the official capital, Abidjan is the economic capital and de facto political capital.

246. The World Fact book, "Cote D'Ivoire," U.S. Central Intelligence Agency, https://www.cia.gov/library/publications/the-world-factbook/geos/to.html.

2. Economy[247]

GDP (2006):	$17.19 billion
GDP growth rate (2006):	1.2%
GDP per Capita (2006)	$1,600
Natural Resources:	Offshore petroleum, natural gas, diamonds, manganese, iron ore, cobalt, bauxite, copper, gold, nickel, tantalum, silica sand, clay, cocoa, coffee, palm oil, timber, hydropower.
Agriculture (2006):	27% of GDP, Products: cocoa, coffee, timber, rubber, corn, rice, tropical foods.
Industry (2006):	18.5% of GDP
Services (2006):	54.5% of GDP
Trade (2004):	Exports: cocoa, coffee, timber, rubber, cotton, palm oil, pineapples, bananas, fish.
Major Markets:	U.S., France, Germany, Netherlands
Imports:	Consumer goods, basic food stuffs (rice, wheat), capital goods
Major Suppliers:	France, Nigeria, China

As it is most Gulf of Guinea nations Cote d'Ivoire is blessed a vast supply of natural resources. Additionally, similar to most Gulf of Guinea nations they are not adept at making the most of the abundance of natural resources that are in country. Cote d'Ivoire's economy is based on agriculture, and backed by foreign investments (primarily by France). Nearly 70% of the population is involved in agriculture.[248] Cote d'Ivoire's economy is at a standstill at 1.2% due to political instability, corruption, and an enormous

247. The World Fact book, "Cote D'Ivoire," U.S. Central Intelligence Agency, https://www.cia.gov/library/publications/the-world-factbook/geos/to.html.

248. Bureau of African Affairs, "Background Note: Cote d'Ivoire," U.S. Department of State, http://www.state.gov/r/pa/ei/bgn/2846.htm.

international debt. Rising issues in the economy include money laundering, financing terrorism, as Hezbollah is present in country and conducting fundraising activities.[249]

3. Political[250]

Government Type:	Republic, lead by president elected for a five year term. The president is head of state and commander in chief of armed forces. Prime Minister is head of government.
Structure:	Consists of a President, Prime Minister, 225 member National Assembly, and Supreme Court (4 chambers-Judicial, Audit, Constitutional, and Administrative)
U.S. Relations:	U.S.-Cameroonian relations have been friendly and close. Although recently the relationship has been strained due the Section 508 restrictions placed on non-humanitarian aid.

Cote d'Ivoire political structure is weak and prone to coups and upheaval, since 1999 every political change has been met with extreme violence. This is demonstrated by the 1999 coup, 2001 failed coup, and subsequent 2002 rebellion. The 2002 rebellion led to the country dividing into two regions; the west, led by militant rebel groups and the east, established government. It was not until March 2007 after five years of failed discussions, reunification attempts and unfulfilled accords and peace attempts, that the Ouagadougou Peace Accord was signed. Major parts of the Ouagadougou Peace Accord are to reunify the country and for former rebels and government forces to merge. Cote d'Ivoire in recent years has had strained relations with the United States as governmental upheaval has caused not only U.S. but other countries to have restraint when dealing with Cote d'Ivoire. Non-Governmental Organizations (NGOs) are also under tough scrutiny

249. U.S. Department of State Bureau for International Narcotics and Law Enforcement Affairs, *International Narcotics Control Strategy Report, Volume II Money Laundering and Financial Crimes* (Washington, DC: GPO, 2007).

250. The World Fact book, "Cote D'Ivoire," U.S. Central Intelligence Agency, https://www.cia.gov/library/publications/the-world-factbook/geos/to.html.

in the country. The are numerous restrictions in place to regulate NGOs, as a recent trend of NGOs not operating as an NGO, but as a false organization not providing services, just collecting money.

4. Social[251]

Religion:	35% - 40% Muslim, 25% - 35% Christian, 10% - 20% Indigenous
Population:	18,013,409 (2007) more than 60 ethnic groups
Literacy rate:	51%
Health:	Infant mortality rate (2007) 8.7%, Life expectancy (2007) 49 years, AIDS rate 7% (2003)
Work Force:	68% Agriculture

Cote d'Ivoire is a small, French speaking, primarily Muslim country, in which political instability has severely limited its progress from third world nation to emerging country. A solid infrastructure lends to the beginning of a country progressing upwards. Although the literacy rate is 51%, the school system is good in relation to regional standards.[252] Cote d'Ivoire has a solid infrastructure as it relates to telecommunications and roadways. There are over 8000 miles of paved roads in country.[253] The telecommunication infrastructure is solid albeit vastly under used.

5. Transnational Issues and Comments

Political unrest has caused a great deal of damage to the economic system in country. This has led to an increased problem with money laundering and smuggling of goods across the country's borders. As the new regime takes control laws are being put in place to curb money laundering activities, however it will take some time to regain the

251. The World Fact book, "Cote D'Ivoire," U.S. Central Intelligence Agency, https://www.cia.gov/library/publications/the-world-factbook/geos/to.html.

252. Bureau of African Affairs, "Background Note: Cote d'Ivoire," U.S. Department of State, http://www.state.gov/r/pa/ei/bgn/2846.htm.

253. Bureau of African Affairs, "Background Note: Cote d'Ivoire," U.S. Department of State, http://www.state.gov/r/pa/ei/bgn/2846.htm.

ability to enforce such laws. A unique issue to Cote d'Ivoire is the ability of terrorist organizations to finance their activities. There are laws in place to control money laundering for crimes involving arms trade, drug trafficking, and fraud. However, money laundering in relation to financing terrorists is not illegal.

Cote de Ivoire has a fledgling military. Its' Armed Forces consists of an army, navy, air force, gendarmerie, and specialized forces. Its' Navy is a pure brown water navy with severely degraded boats. The air force consists of a transport/utility aircraft, two utility helicopters, and one attack helicopter. There are a total of 21,000 members of the armed forces.[254] There are currently UN peacekeeping forces in country to maintain the cease-fire line within the country. The cease-fire line is a result of the 2002 failed coup by Movement of Cote de Ivoire. Western parts of the country are basis for military rebel groups Ivoirian Popular Movement for the Great West (MPIGO) and the Movement for Justice and Peace (MJP) along with the MPCI.

As most African nation suffer with the AIDS epidemic, so does Cote d'Ivoire. Although the stated AIDS rate is 7%, the number has been estimated as high as 10%.[255] Urban areas are hardest hit with the epidemic, the percentage of persons with HIV/AIDS doubles as compared to rural areas.

6. Needs Summary

- Medical (HIV/AIDS, Malaria)
- Political stability
- Training and upgrades to brown water Navy

254. Bureau of African Affairs, "Background Note: Cote d'Ivoire," U.S. Department of State, http://www.state.gov/r/pa/ei/bgn/2846.htm.

255. World Health Organization, "Cote d'Ivoire," http://www.who.int/hiv/HIVCP_CIV.pdf.1

C. AN ANALYSIS OF GHANA

1. Geography[256]

Total Area:	238,538 sq. km. (92,100 sq. mi.); about the size of Illinois and Indiana combined.
Ports:	Takoradi, Tema
Coastal Features:	539 km (334.92 mi.) of coastline; Western Coast: sandy beaches and lagoon; Central Coast: rocky beaches, littoral sand barriers, and lagoons; East Coast: sandy beaches, Volta River delta
Climate:	Tropical, two rainy seasons (May – June in the South and August – September in the North)
Major Cities:	Accra, Kumasi, Tema, Sekondi-Takoradi

Ghana is home to Lake Volta, the largest man-made lake in the world. [257] The Akosombo Dam is located on Lake Volta. It accounts for 60% of Ghana's power.[258] However, due to a recent drought, Lake Volta's hydropower capacity and output has been dropping significantly. In the 1980's the dam accounted for 100% of Ghana's power. [259] This loss of power production has had a significant effect on the economy. Economic growth has slowed from 6.5% to 4% - 5%.[260]

256. The World Fact book, "Ghana," U.S. Central Intelligence Agency, https://www.cia.gov/library/publications/the-world-factbook/geos/to.html.

257. Bureau of African Affairs, "Background Note: Ghana," U.S. Department of State, http://www.state.gov/r/pa/ei/bgn/2860.htm

258. Michael M. Phillips, "How Ghana's Economic Turnaround Is Threatened," *Wall Street Journal* (2007): A5.

259. Michael M. Phillips, "How Ghana's Economic Turnaround Is Threatened," *Wall Street Journal* (2007): A5.

260. Michael M. Phillips, "How Ghana's Economic Turnaround Is Threatened," *Wall Street Journal* (2007): A5.

2. Economy[261]

GDP (2006):	$10.1 billion
GDP growth rate (2006):	6%
GDP per Capita (2006):	$2,700
Natural Resources:	Gold timber, industrial diamonds, bauxite, manganese, fish, rubber, hydropower (decreasing rapidly), silver, salt, limestone
Agriculture (2006):	37.3% of GDP, Products: cocoa, rice, coffee, cassava (tapioca), peanuts, corn, shea nuts, bananas; timber
Industry (2006):	25.3% of GDP
Services (2006):	37.5% of GDP
Trade (2004):	Exports: gold, cocoa, timber, tuna, bauxite, aluminum, manganese ore, diamonds
Major Markets:	Netherlands, U.K., U.S., Spain, Belgium, France
Imports:	food stuffs (rice, wheat), machinery, petroleum
Major Suppliers:	Nigeria, China, U.K., Belgium, U.S., Brazil, South Africa, France

Ghana is an emerging African country with an abundance of natural resources. Its' economic sector relies heavily on foreign investments. More recently, a prolonged dry spell, has (and is) setting their economy back. Vast amounts of hydroelectric power are produced by the Akosombo Dam at Lake Volta reservoir. However, with significantly decreased water levels (41 feet below high water mark) 4 of 6 turbines have been shut down as the water doesn't reach high enough to run them.[262] Power is being rationed and forcing companies to find other means to power factories, etc.

261. The World Fact book, "Ghana," U.S. Central Intelligence Agency, https://www.cia.gov/library/publications/the-world-factbook/geos/to.html.

262. Michael M. Phillips, "How Ghana's Economic Turnaround Is Threatened," *Wall Street Journal* (2007): A5.

3. Political[263]

Government Type:	Democracy, lead by president elected for a four year term (max 2 terms). The president is head of state, head of government, and commander in chief of armed forces.
Structure:	Consists of a President, 25 member Council of State, 230 member Parliament, and Supreme Court (members nominated by President and approved by Parliament)
U.S. Relations:	U.S. - Ghana relations are strong and close.

National government is young but fairly stable. In 2001, power changed hands democratically and without violence for the first time in the 50 year independence of Ghana. Ghana is a player in foreign relations. Ghana is a member of the United Nations, World Trade Organization, African Union, and the Economic Community of West African Nations. Extremely active [sent troops] in UN peacekeeping missions throughout West Africa. Ghana appears to be very receptive to US military aid in training, especially in the security and drug enforcement arenas. Ghana's Armed Forces (Army, Navy, Air Force) are among the better trained African military forces. This is demonstrated in the participation with various UN peacekeeping forces.

4. Social[264]

Religion:	Christian 68.8%, Muslim 15.9%
Population:	22,931,299 (2007)
Literacy rate (2000):	57.9%
Health:	Infant mortality rate (2007) 5.3%, Life expectancy (2007) 59 years, AIDS rate 3.9% (2003)

263. The World Fact book, "Ghana," U.S. Central Intelligence Agency, https://www.cia.gov/library/publications/the-world-factbook/geos/to.html.

264. The World Fact book, "Ghana," U.S. Central Intelligence Agency, https://www.cia.gov/library/publications/the-world-factbook/geos/to.html.

Work Force: Agriculture and fishing 47.9%, Industry and transport 16.2%, Sales and clerical 19.3%, Services 5.9%, Professional 8.9%, Other 1.8%.

It is a majority Christian country, with a heavy focus on education. The literacy rate is nearly 77%, 20th out 53 countries in Africa.[265] The majority of its people are in farming / agriculture related jobs. As it is in most African nation major health concerns includes: HIV/AIDS, Malaria (on the decrease). The Ministry of health is attempting to make strides in improving public health. NGO's such as USAID are also working heavily to provide assistance. However, Ghana is cracking down on NGO's in country as many are corrupt.

5. Transnational Issues

Ghana is in the midst of a continuous reconstruction and rebuilding effort. The U.S. has contributed over 50 million dollars in 2005 to aid in the efforts. The U.S. has partnered with Ghana in facilitating close relations in terms of educational, scientific, and military. Ghana is one of the participating countries of the African Contingency Operations Training and Assistance program. This partnership has the U.S aiding Ghanaian forces, in peace operations and humanitarian relief efforts. A number of U.S. companies are investing and operating in country. These partnerships are furthermore strengthening economic and social ties with the U.S. With the continuing aid and support from the U.S. both economically and militarily, Ghana's future appears to be bright.

The most detrimental issue to Ghana is the return of refugees who fled to Cote d'Ivoire during the civil war. They are now returning to Ghana, in an effort to flee to strife that is rampant Cote d'Ivoire.

6. Needs Summary

- Medical (HIV/AIDS, Malaria)
- Better use of natural resources

265. Encarta Encyclopedia, "Ghana," http://encarta.msn.com/encyclopedia_761570799_3/Ghana.html.

- Improving telecommunications
- School facilities

D. AN ANALYSIS OF TOGO

1. Geography[266]

Total Area:	56,785 sq. km.; slightly smaller than West Virginia. Major Cities/Capital: Lome, 850,000
Ports:	Kpeme, Lome
Coastal Features:	56 km
Climate:	tropical; hot, humid in south; semiarid in north

Port Info: The port offers two piers the major one being 1720-m long with a 950m back-up structure eastwards. The maximum water drought is 14m. There are two quays: 1: Measures 366,5 m in length by 72 m in width with 4 berths for conventional ships and has a total capacity of more than 400 000 tons. 2: Measures 250 m in length and 140 m in width. It can accommodate vessels of 11, 000 to 15, 000 DWT (RORO).[267]

2. Economy[268]

GDP (2004):	$2.1 billion
GDP growth rate (2006 est.):	2%
Per capita (2006 est.):	$1,700
Natural Resources:	phosphates, limestone, marble, arable land
Agriculture:	Coffee, cocoa, cotton…

266. Bureau of African Affairs, "Togo," U.S. Department of State, http://www.state.gov/g/drl/rls/hrrpt/2006/78762.htm.

267. Seaport Homestead, "Port of Lome, Togo," http://seaport.homestead.com/files/lome.html

268. The World Fact book, "Togo," U.S. Central Intelligence Agency, https://www.cia.gov/library/publications/the-world-factbook/geos/to.html.

Trade (2006 est.)[269]: Exports $868.4 million: re-exports, cotton, phosphates, coffee, cocoa

Imports $1.208 billion: machinery and equipment, foodstuff, petroleum products

Major Markets: Ghana, France, Cote d'Ivoire, Germany, Nigeria, Canada, China, Benin

A majority of Togo's economy is based on subsistence agriculture. Food and cash crop production employs the majority of the labor force and accounts about 42% of GDP. They have achieved self-sufficiency in food crops. In terms of natural resources, phosphate is their #1 export. Total trade to the U.S. is $16million. It is a member of the Economic Community of West African States (ECOWAS), African Economic and Monetary Union (UEMOA), and West African Development Bank (BOAD).

Togo has turned to the International Monetary Fun (IMF), Paris Club, Africa Development Bank (ADB) and World Bank for economic reform and debt relief.

3. Political[270]

Government Type: Republic

Structure: President (chief of state); Prime Minister (head of government); legislative-National Assembly; Judicial-Supreme Court

U.S. Relations: Togo is pro-western, market-oriented, and has good relations with the US.

Regarding the African Growth and Opportunity Act (AGOA), it is not eligible due to political pluralism and rule of law. The Peace Corps is actively involved in promoting HIV/AIDS awareness and prevention here.

269. The World Fact book, "Togo," U.S. Central Intelligence Agency, https://www.cia.gov/library/publications/the-world-factbook/geos/to.html.

270. The World Fact book, "Togo," U.S. Central Intelligence Agency, https://www.cia.gov/library/publications/the-world-factbook/geos/to.html.

4. Social[271]

Religion (2004): Animist 33%, Christian 47%, Muslim 13.7%, other 6.1%

Population (2007 est.): 5,701,579

Literacy rate (2004): 60.9%

Health (2007 est.): Life expectancy 57.8 years

HIV/AIDS Prevalence (2003 est.): 4.1%

HIV/AIDS, people living with (2003 est.): 110,000

Major Diseases: Malaria, Yellow Fever, hepatitis A, typhoid fever.

Work Force (1998): agriculture 65%, industry 5%, services 30%.

5. Transnational Issues[272]

In 2001, Benin claimed Togo moved boundary monuments – a joint commission continues to resurvey the boundary; in 2006, 14,000 Togolese refugees remained in Benin and Ghana out of the 40,000 who fled there in 2005. It is a transit hub for Nigerian heroin and cocaine traffickers.

6. Comments

Corruption and poor public administration inhibit domestic and foreign investment. The government is unable to provide to its citizens in terms of education, health, sanitation, and other basics services. Togo mainly relies on NGO's to combat health problems; HIV/AIDS, malaria, tuberculosis, and cholera. Water and electricity are not reliable which in turn hamper economic growth.

Togo is a country of origin, transit, and destination for trafficking person; women and children. The human rights situation in the country improved; however, serious human rights problems continued, including the inability of citizens to change their government; beatings and abuse of detainees; government impunity; harsh prison conditions; arbitrary and secret arrests and detention; lengthy pretrial detention; executive

271. The World Fact book, "Togo," U.S. Central Intelligence Agency, https://www.cia.gov/library/publications/the-world-factbook/geos/to.html.

272. The World Fact book, "Togo," U.S. Central Intelligence Agency, https://www.cia.gov/library/publications/the-world-factbook/geos/to.html.

control of the judiciary; frequent infringement of citizens' privacy rights; restrictions on the press, including closing media outlets; restrictions on freedom of assembly and movement; harassment of human rights workers; female genital mutilation (FGM) and violence against women; discrimination against women and ethnic minorities; trafficking in persons, especially children; child labor; and lack of worker's rights in export processing zones (EPZ)[273].

7. Needs Summary

- Counter-drug trafficking efforts
- Improve HIV/AIDS awareness and prevention
- Improve governance; improve government to support/provide to its people.
- Improve basic infrastructure.

E. AN ANALYSIS OF BENIN

1. Geography[274]

Total Area:	112,620 sq. km.; slightly smaller than Pennsylvania. Major Cities/Capital: Porto-Novo (295,000); Cotonou (2 million); political/economic
Ports:	Cotonou
Coastal Features:	112 km
Climate:	tropical; hot, humid in south; semiarid in north

Port Info: The port of Cotonou is a deep water port. It has 8 berthing stations divided into 4 berths of 155m for conventional vessels, 2 classical berths of 180m for

273. Bureau of African Affairs, "Togo," U.S. Department of State, http://www.state.gov/g/drl/rls/hrrpt/2006/78762.htm.

274. Bureau of African Affairs, "Background Note: Benin," U.S. Department of State, http://www.state.gov/r/pa/ei/bgn/6761.htm.

conventional vessels and 1 berth of 220m for container vessels and 1 berth at the end of the commercial quay to take roll on, roll off vessel.[275]

2. Economy[276]

GDP (2006 est.):	$8.989 billion
GDP growth rate (2006 est.):	4%
Per capita (2006 est.):	$1,100
Natural Resources:	oil, limestone, marble, timber
Agriculture:	Corn, sorghum, cassava…
Trade (2006 est.)[277]:	Exports $485 million: cotton, oil, palm products, cocoa. Imports $726 million: foodstuff, tobacco, petroleum products, energy, and capital goods.
Major Markets:	Nigeria, France, China, Italy, Brazil, Libya, Indonesia, U.K., Cote d'Ivoire

The majority of Benin's economy is based on subsistence agriculture. Cotton production accounts about 40% of the GDP and 80% of total exports. Oil and fishing provides the rest of the exports. Benin relies on foreign investment to spur growth and fuel economic expansion. It is a member of ECOWAS, UEMOA, and BOAD. Benin has turned to the International Monetary Fun (IMF), Paris Club, Africa Development Bank (ADB) and World Bank for economic reform and debt relief, specifically under the Heavily Indebted Poor Countries (HIPC) Initiative.

3. Political[278]

Government Type:	Republic, under multiparty democratic rule

275. OT Africa Line, "Benin," http://www.otal.com/benin/.

276. The World Fact book, "Benin," U.S. Central Intelligence Agency, https://www.cia.gov/library/publications/the-world-factbook/geos/bn.html.

277. Bureau of African Affairs, "Background Note: Benin," U.S. Department of State, http://www.state.gov/r/pa/ei/bgn/6761.htm.

278. Bureau of African Affairs, "Background Note: Benin," U.S. Department of State, http://www.state.gov/r/pa/ei/bgn/6761.htm.

Structure:	President (chief of state); legislative-Unicameral; Judicial-Constitutional Court
U.S. Relations:	Benin has excellent relations with the U.S.

Eligible for the African Growth and Opportunity Act (AGOA), Benin hopes to increase trade and stimulate growth through U.S. investment in their country. The primary involvement in Benin with the U.S. is through the efforts of USAID programs. USAID efforts have been promoting HIV/AIDS awareness and prevention, family health, education and governance.[279] Benin is involved in a $308 million Millennium Challenge Compact (MCC) to increase investment and private sector activity. The U.S. Peace Corp is active in Benin, promoting health, education and small enterprise development.

4. Social[280]

Religion (2004):	Animist 50%, Christian 30%, Muslim 20%
Population (2005 est.):	7.86 million
Literacy rate (2004):	34.7%
Health (2003 est.)[281]:	Life expectancy 53.4 years
	HIV/AIDS Prevalence (2003 est.): 1.9%
	HIV/AIDS, people living with (2003 est.): 68,000
	Major Diseases: Malaria, Yellow Fever, hepatitis A, typhoid fever

5. Transnational Issues[282]

Rival gangs clash between Nigeria and Benin, along the border. Benin is a transit hub for Nigerian heroin and cocaine traffickers; money laundering is also prevalent.

279. U.S. Agency International Development, "USAID – Benin,"

280. The World Fact book, "Benin," U.S. Central Intelligence Agency, https://www.cia.gov/library/publications/the-world-factbook/geos/bn.html.

281. The World Fact book, "Benin," U.S. Central Intelligence Agency, https://www.cia.gov/library/publications/the-world-factbook/geos/bn.html.

282. The World Fact book, "Benin," U.S. Central Intelligence Agency, https://www.cia.gov/library/publications/the-world-factbook/geos/bn.

6. Comments

The bulk of the U.S. effort in support of consolidating democracy in Benin is focused on long-term human resource development through U.S. Agency for International Development programs. Their efforts focus on primary education, family health (including family planning), women's and children's health, and combating sexually transmitted diseases, especially the spread of HIV.

USAID's Democracy and Governance program also emphasizes encouraging greater civil society involvement in national decision making; strengthening mechanisms to promote transparency and accountability; improving the environment for decentralized private and local initiatives; and enhancing the electoral system and the national legislature.

The government of Benin generally respects the human rights of its citizens; however, some problems have been recorded. The occasional use of excessive police force and vigilante violence resulted in deaths. Impunity, harsh prison conditions, arbitrary arrest and detention with prolonged pre-trial detention, and judicial corruption are cited. Women are sometimes victims of violence and societal discrimination, and female genital mutilation (FGM) is common. There also are reports of trafficking and abuse of children, forced labor and child labor.

Despite these issues, Benin is on track for encouraging increased freedom of press and strengthening of civil society institutions to further reinforce the country's democratic foundations. Market-oriented economic policies have been implemented since 1991, and there is broad political consensus for these policies.[283]

7. Needs Summary

- Counter-drug trafficking efforts
- Counter-money laundering efforts.
- Improve HIV/AIDS awareness and prevention

[283]. Bureau of African Affairs, "Background Note: Benin," U.S. Department of State, http://www.state.gov/r/pa/ei/bgn/6761.htm.

- Improve governance; improve government to support/provide to its people.
- Improve basic infrastructure.

F. AN ANALYSIS OF NIGERIA

1. Geography[284]

Total Area:	923.8 thousand sq. km.; size of CA, NV, and AZ Major Cities/Capital: Abuja-Capital (452,000); Kano (9.3million); Lagos (9.01million)
Ports:	Calabar, Lagos, Port Harcourt
Coastal Features:	853 km
Climate:	equatorial in south; tropical in center; arid in north

Port Information:[285]

Lagos is the principle port of Nigeria situated on the Gulf of Guinea. The port is split into three main sections: Lagos, Apapa and Tin Can Island. Apapa is Nigeria's largest port and contains a number of wharfs. Maximum capacity of the terminal is 22,000 TEU and served by 6 designated container berths with a quay length of 950 meters. There is 6,400m2 of covered storage space. Tin Can is a self contained port entered through Badagry Creek via a 200m wide channel which has been dredged to 8.5m. Tin Can provides 11 berths including seven break-bulk general cargo berths, one dry bulk cargo berth and two dedicated RORO berths (numbers 9 and 10). Total length over the quays is over 2000 meters and has a maximum draught of 10 meters - up to 13 vessels can be accommodated at a time. Berth No 9 has special RORO ramps to work the RORO vessels. There are five transit sheds and three warehouses offering a covered

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284. Bureau of African Affairs, "Background Note: Nigeria," U.S. Department of State, http://www.state.gov/r/pa/ei/bgn/2836.htm.

285. Nigerian Ports Authority, "Port Installations," http://www.nigerian-ports.net/normal/operations/installations.html.

storage area of 54,000m2 and an open storage area of 125,000m2. There are also 5 vehicle parks - each able to accommodate 6000 cars at a time.

Port Harcourt: This is a natural port, and maintains the status of being the third largest in the country. The port has an extensive range of handling equipment and provides a maximum draught of 7.6 meters. The port houses a main quay of 1,390 meters long- 13 berths a dockyard with 5 mooring berths and tanker buoys

Calabar port: 4 berths for general cargo handling, storage capacity of 40,000tones, max draught of 8 meters.

2. Economy[286]

GDP (2006 est.):	$191.4 billion
GDP growth rate (2006 est.):	5.3%
Per capita (2006 est.):	$1,500
Natural Resources:	petroleum, natural gas, tin, columbite, iron ore, coal, limestone, lead, zinc
Agriculture:	cocoa, palm oil, yams, cassava, sorghum, millet, corn…
Trade (2005)[287]:	Exports $59 billion: petroleum, cocoa, rubber
Imports $25 billion:	machinery, chemical, transport equipment, manufactured goods, food; live animals
Major Markets:	China, U.S., U.K.

The majority of Nigeria's economy is based on oil. This provides about 20% of their GDP, 95% of foreign exchange earnings, and about 65% of budgetary revenue. 5th largest exporter of oil to the U.S; 40% of exported oil goes to the U.S. Yet, poor corporate relations with indigenous communities, vandalism of oil infrastructure, ecological damage, and security problems in the Niger-delta region hamper growth and reliability of Nigeria's oil throughput.

286. The World Fact book, "Nigeria," U.S. Central Intelligence Agency, https://www.cia.gov/library/publications/the-world-factbook/geos/ni.

287. Bureau of African Affairs, "Background Note: Nigeria," U.S. Department of State, http://www.state.gov/r/pa/ei/bgn/2836.htm.

Its agricultural sector is not keeping up with the demand of population growth due to mismanagement, inconsistent/poor policies and lack of basic infrastructure. Agriculture still accounts for 41% of their GDP and provides employment to 2/3 of its labor force. Nigeria is the largest trading partner with the U.S. Total two-way trade is valued around $30.8billion. The U.S. is also the largest foreign investor in the country.

It is a member of ECOWAS, UEMOA, and AFDB, Organization of Petroleum Exporting Countries (OPEC) and many others. Nigeria has turned to the IMF and the Paris Club for debt relief and fiscal policy assistance. Nigeria has been one of the highlights of the Gulf of Guinea nations to significantly reduce their external debt from 36% of GDP in 2004 to less than 4% of GDP by 2007.

3. Political[288]

Government Type:	Federal Republic
Structure:	President (chief of state); legislative-bicameral National Assembly; Judicial-Supreme Court
U.S. Relations:	Excellent, since 1999. Share the same foreign policy goals.

Nigeria is eligible for the African Growth and Opportunity Act (AGOA) – a program of "Investing in People," a top U.S. foreign assistance priority. Major initiatives are in play focusing on education, health, and governance. On health related issues, attention is focused on malaria/polio treatment and eradication, prevention/awareness of HIV/AIDS, and family planning.

On education issues, Nigeria is bolstering efforts to improve teacher capacity, student achievement and community participation.

On governance issues, efforts are in place to develop inclusive, transparent, and effective institutions of democratic governance. This is accomplished by instituting the basic mechanics of a working government; holding official accountable for their actions

288. Bureau of African Affairs, "Background Note: Nigeria," U.S. Department of State, http://www.state.gov/r/pa/ei/bgn/2836.htm.

(free and fair elections); strengthening the capacity and transparency of law enforcement agencies. A majority of U.S. endeavors in the country are led by USAID.

4. Social[289]

Religion: Muslim 50%, Christian 40%, animist 10%

Population (2007 est.): 135,031,164

Literacy rate (2003 est.): 68%

Health (2007 est.): Life expectancy 47.44years

HIV/AIDS Prevalence (2003 est.): 5.4% HIV/AIDS

People living with HIV/AIDS (2003 est.): 3.6million

Major Diseases: Malaria, Yellow Fever, Hepatitis A, Typhoid Fever

Work Force (1999 est.): agriculture: 70%, industry: 10%, services: 20%

5. Transnational Issues[290]

The Joint Border Commission with Cameroon resolved boundary differences, ceding the Bakassi Peninsula to Cameroon. There still is a maritime boundary dispute between Cameroon, Nigeria, and Equatorial Guinea.

It is a major transit hub for heroin and cocaine traffickers bound for Europe, East Asian and North American markets. Money laundering is a significant problem.

6. Comments

Nigeria is the most populous country in Africa. Its oil reserves play a huge role in its growing economy; still, half of its population lives in poverty with a myriad of problems that form a common theme throughout the Gulf of Guinea region - corruption, unemployment, illiteracy, poor health, and challenges to its government in addressing these issues adequately. Also, there are many vigilante groups in the Nigeria Delta

289. The World Fact book, "Nigeria," U.S. Central Intelligence Agency, https://www.cia.gov/library/publications/the-world-factbook/geos/ni.

290. The World Fact book, "Nigeria," U.S. Central Intelligence Agency, https://www.cia.gov/library/publications/the-world-factbook/geos/ni.

region who target oil infrastructure, either for their own personal gain or for political animosities.

7. Needs Summary

- Secure the Niger Delta region from militant attacks.
- Counter drug trafficking
- Counter money laundering
- Assist in improving governance, health, education, financial issues/policies.

G. AN ANALYSIS OF CAMEROON

1. Geography[291]

Total Area: 184,000 square miles (Slightly larger than California)

Ports: Douala, Limbe and Kribi

Douala is the countries major port, also acting as major point of entry for the central African region.[292]

Coastal Features: 402 kilometer coastline

Terrain: Northern plains, central and western highlands, southern and coastal tropical forest.

Climate: Northern plains, the Sahel region- semiarid and hot (7-month dry season); central and western highlands are slightly cooler with a shorter dry season; southern tropical forest are warm (4-month dry season); coastal tropical forests are warm and humid year around.

291. Bureau of African Affairs, “Background Note: Cameroon,” U.S. Department of State, http://www.state.gov/r/pa/ei/bgn/26431.htm

292. Office of the U.S. Trade Representative, “Cameroon,” http://www.ustr.gov/assets/Document_Library/Reports_Publications/2001/2001_NTE_Report/asset_upload_file209_6557.pdf.

The port of Douala is located on the River Wouri, with 11 cargo berths, 16 deep water berths, and two IHI gantry cranes (40 ton capacity), which make it a very attractive re-supply port for GFS operations in the region.[293] Though the Port of Douala is considered the major port of entry for the central African region, it is one of the most inefficient ports in Africa. Delays average 3 days for containers to clear customs. In 2000, the government privatized the port's administration with the hopes of improving efficiency.[294] Cameroon has a number of environmental issues to include waterborne diseases, which are prevalent, deforestation, overgrazing, desertification, poaching, and over fishing.[295]

2. Economy[296]

GDP (2006):	$16.37 billion
GDP growth rate (2006):	4.1%
Per Capita Income (2006):	$2,400
Natural Resources:	Oil, timber, hydroelectric power, natural gas, cobalt, nickel
Agriculture (2006):	45.2% of GDP, Products: timber, coffee, tea, bananas, coca, rubber, palm oil, pineapples, cotton.
Industry (2006):	16.1% of GDP
Services (2006):	38.7% of GDP
Trade (2002):	Exports $1.8 billion: crude oil, timber and finished wood products, cotton cocoa, aluminum and aluminum products, coffee, rubber, bananas.
Major Markets:	European Union, CEMAC, China, U.S., Nigeria

293. OT Africa Lines, "Cameroon," http://www.otal.com/cameroon/index.htm.

294. Office of the U.S. Trade Representative, "Cameroon," http://www.ustr.gov/assets/Document_Library/Reports_Publications/2001/2001_NTE_Report/asset_upload_file209_6557.pdf.

295. The World Fact book, "Cameroon," U.S. Central Intelligence Agency, https://www.cia.gov/library/publications/the-world-factbook/geos/cm.html.

296. Bureau of African Affairs, "Background Note: Cameroon," U.S. Department of State, http://www.state.gov/r/pa/ei/bgn/26431.htm.

Imports:	crude oil, vehicles, pharmaceuticals, aluminum oxide, rubber, foodstuffs, and grains, agricultural inputs, lubricants, used clothing.
Major Partners:	France, Nigeria, Italy, U.S., Germany, Belgium, Japan

Cameroon's economy has enjoyed five years of four-five percent annual growth. The government has liberalized trade restrictions, foreign investment, as well as port and customs administration. Economic reform measures suggested by the International Monetary Fund (IMF) and the World Bank have also helped to stabilize the currency and legitimacy of the country in the international arena. It is important to note that Cameroon is a member of the Central African Economic and Monetary Community (CEMAC) which also includes the countries of Central African Republic, Chad, Equatorial Guinea, Gabon, and Republic of Congo. CEMAC allows free trade between member countries (although not completely implemented), a common currency, and a common central bank. International oil and cocoa prices have a significant impact on the economy.[297]

3. Political[298]

Government Type:	Republic, strong central government, led by a president. The President is chief of state, with a one time seven year term. The Prime Minister is head of government.
Structure:	There are four major political parties in the political system. The Legislature meets three times a year, consisting of 180 members. The creation of a Senate was called for under the last revision of the countries constitution in 1996; however it is still not completely implemented. The executive branch controls the judicial branch.

297. The World Fact book, "Cameroon," U.S. Central Intelligence Agency, https://www.cia.gov/library/publications/the-world-factbook/geos/cm.html.

298. Bureau of African Affairs, "Background Note: Cameroon," U.S. Department of State, http://www.state.gov/r/pa/ei/bgn/26431.htm.

U.S. Relations:	U.S.-Cameroonian relations are close, although they have been tested by concerns over human rights abuses and the pace of political and economic liberalization.

Elections have had a history of irregularities, which have resulted in the President winning re-election by large majorities. The last election in 2004 was supervised by the National Elections Observatory (NEO), an elections watchdog agency created by the legislature, as well as a number of diplomatic missions. The results did show some irregularities, however nothing serious was found that would have changed the election results. Although censorship was abolished in 1996, the government still has seized privately owned newspapers for writing articles in opposition to the President. Radio and television are all state owned organizations, although since 2000, when privatization was legalized, not a single license has been authorized by the government. The official languages of the country are both English and French, with a number of local dialects being used in the rural portions of the country.

4. Social[299]

Religion:	Indigenous beliefs 25%, Christian 53%, Islam 22%
Population:	18,060,382 (2006) composed of 250 ethnic groups
Literacy rate:	75%
Health:	Infant mortality rate (2007) 6.6%, Life expectancy (2007) 52.86 years, AIDS (2003) 560,000 people infected, 6.9% of population.
	Infectious diseases: *food or waterborne diseases:* bacterial diarrhea, hepatitis A, and typhoid fever *vector borne diseases:* malaria and yellow fever are high risks in some locations *water contact disease:* schistosomiasis
Work Force:	Agriculture 70%, Industry and commerce 13%

299. Bureau of African Affairs, "Background Note: Cameroon," U.S. Department of State, http://www.state.gov/r/pa/ei/bgn/26431.htm.

There is significant poverty in the country despite the government's significant oil revenues; 30% of the population is unemployed and 48% of the population lives below the poverty line. The risk of major infectious disease is very high and avian flew has been identified among birds in the country.

5. Transnational Issues[300]

The Joint Border Commission with Nigeria reviewed the 2002 ICJ ruling on the entire boundary and bilaterally resolved differences, including the agreement which immediately cedes sovereignty of the Bakassi Peninsula to Cameroon with a phase-out of Nigerian control within two years while resolving repatriation issues. The implementation of the ICJ ruling on the Cameroon-Equatorial Guinea-Nigeria maritime boundary in the Gulf of Guinea is pending due to imprecisely defined coordinates and a sovereignty dispute between Equatorial Guinea and Cameroon over an island at the mouth of the Ntem River; only Nigeria and Cameroon have heeded the Lake Chad Commission's admonition to ratify the delimitation treaty, which also includes the Chad-Niger and Niger-Nigeria boundaries.

There is a significant refugee population with 39,303 refugees from Chad, 9,711 from Nigeria, 13,000 from Central African Republic, and an additional 10,000 refugees from Central Africa. These refugees contribute greatly to the unemployed and poverty stricken population. The government of Cameroon has not established an effective policy to integrate them into the society or arrange for their return to their country of origin.

6. Comments

The country of Cameroon has incredible potential to evolve from third world status to a modern society. This can only be achieved through greater transparency of the government and a dramatic reduction in corruption within the government and its agencies which control most of the public works, and media outlets. Very little of the

300. The World Fact book, "Cameroon," U.S. Central Intelligence Agency, https://www.cia.gov/library/publications/the-world-factbook/geos/cm.html.

country’s wealth from oil has been translated into developing the country’s infrastructure and the daily wellbeing of the population at large.

7. Needs Summary

- Coordination to resolve Gulf of Guinea boarder disputes.
- Train with Coast Guard of Cameroon and neighboring countries to protect waters and avoid future disputes.
- Medical treatment and prevention training for common diseases and AIDS.
- Coordinated use of government revenues to support public works programs to build and revitalize infrastructure.

H. AN ANALYSIS OF EQUATORIAL GUINEA

1. Geography[301]

Total Area:	28,050 square kilometers
Ports:	Luba, and Malabo
Coastal Features:	296 Kilometers of coastline
Terrain:	Coastal plains, hilly inland, mostly tropical rain forest
Climate:	Tropical; hot and humid year around

The port of Luba has undergone extensive renovations in the past couple of years and hopes to become the major port for oil transportation for the West African region. Light deforestation has occurred in Equatorial Guinea, the smallest country in Africa; however this was mostly in an effort to create more agricultural land, than for harvesting the lumber. Rich oil reserves were found off the coast in the late 1990’s. Unfortunately

301. Bureau of African Affairs, “Background Note: Equatorial Guinea,” U.S. Department of State, http://www.state.gov/r/pa/ei/bgn/7221.htm.

however, Equatorial Guinea has one major environmental issue, the tap water is non-potable.[302]

2. Economy[303]

GDP (2005):	$7.64 billion
GDP growth rate (2005): 18.6%	
Per Capita Income (2005): $50,200[304]	
Natural Resources:	Oil, natural gas, timber, gold, manganese, and uranium
Agriculture (2006):	2.8% of GDP, Products: timber, coffee, bananas, coca, palm oil, rice, yams, cassava, manioc, and livestock
Industry (2006):	92.6% of GDP
Services (2006):	4.5% of GDP
Trade (2002):	Exports $8.961 billion: hydrocarbons, timber. Trade Partners: China, U.S., Spain, Canada, France, Great Britain, Cameroon, Norway
Imports:	Heavy equipment for oil related use.

Oil and gas production is the foundation of the Equatorial Guinean economy. The economy has seen double digit growth since 2000 and was as high as 66% in 2001. The per capita income has increased dramatically, yet there is 30% unemployment. Steps in recent years by the government to allow and promote investment into previously government controlled sectors of the economy has increased job creation, development projects, and an overall liberalized economy. Unfortunately, there remains a significant amount of government oversight, and government officials are known to be especially corrupt. The government has openly asked for U.S. investment in the country and

302. The World Fact book, "Equatorial Guinea," U.S. Central Intelligence Agency, https://www.cia.gov/library/publications/the-world-factbook/geos/ek.html.

303. Bureau of African Affairs, "Background Note: Equatorial Guinea," U.S. Department of State, http://www.state.gov/r/pa/ei/bgn/7221.htm.

304. The World Fact book, "Equatorial Guinea," U.S. Central Intelligence Agency, https://www.cia.gov/library/publications/the-world-factbook/geos/ek.html.

desperately needs assistance in managing its oil wealth to develop the country's old infrastructure and create meaningful social programs.

3. Political[305]

Government Type:	Republic, strong central government, led by president.
Structure:	The ruling party since 1987 has been the Partido Democratico de Guinea Equatorial; however there are numerous other minor parties which formed after the ban on opposition parties was lifted in the early 1990's. There are Executive, Legislative, and Judicial branches of government. The Legislative branch is composed of a 100 member parliament.
U.S. Relations:	U.S.-Equatorial Guinea relations are favorable, although there have been concerns over human rights abuses, corruption, and human trafficking. However, Equatorial Guinea is building a consulate in Houston, Texas to help it be closer to the U.S. oil companies which dominate the private investment in the country.

Since the first freely contested elections in 1995, President Obiang has won every election with most opposition parties and international watchdog agencies considering most invalid due to massive fraud. Elections for the parliament have seen similar results with the Presidents party winning landslide victories and controlling 98 of 100 seats. Despite a clearly corrupt election process, under President Obiang, schools have reopened, primary education enhanced, and many public utilities and roads have been restored.

305. Bureau of African Affairs, "Background Note: Equatorial Guinea," U.S. Department of State, http://www.state.gov/r/pa/ei/bgn/7221.htm.

4. Social[306]

Religion:	Predominantly Roman Catholic, pagan practices
Population:	551,201 (2007) composed of 6 ethnic groups
Literacy rate:	85.7%
Health:	Infant mortality rate (2007) 8.7%, Life expectancy (2007) 49.5 years, AIDS (2001) 5900 people infected, 3.9% of population. Infectious diseases: *food or waterborne diseases:* bacterial diarrhea, hepatitis A, and typhoid fever *vector borne disease:* malaria
Work Force:	Agriculture 2.8%, Industry and commerce 97.1%

The risk of infectious disease is very high. Equatorial Guinea is a transit and destination country for trafficking in persons. Most men work in the industrial sector, while children are often used as house servants or street vendors, and women and girls are generally exploited through prostitution.[307]

5. Transnational Issues[308]

The Joint Border Commission reviewed the 2002, ICJ ruling on an equidistance settlement of the Cameroon-Equatorial Guinea-Nigeria maritime boundary in the Gulf of Guinea, but a dispute between Equatorial Guinea and Cameroon over an island at the mouth of the Ntem River and imprecisely defined maritime coordinates in the ICJ decision delay final delimitation; UN urges Equatorial Guinea and Gabon to resolve the sovereignty dispute over Gabon-occupied Mbane and lesser islands and to create a maritime boundary in the hydrocarbon-rich Corisco Bay.

306. Bureau of African Affairs, "Background Note: Equatorial Guinea," U.S. Department of State, http://www.state.gov/r/pa/ei/bgn/7221.htm.

307. The World Fact book, "Equatorial Guinea," U.S. Central Intelligence Agency, https://www.cia.gov/library/publications/the-world-factbook/geos/ek.html.

308. The World Fact book, "Equatorial Guinea," U.S. Central Intelligence Agency, https://www.cia.gov/library/publications/the-world-factbook/geos/ek.html.

6. Comments

The country of Equatorial Guinea has the best potential of any country in the region to modernize and greatly improve its infrastructure and the life of its people, through the prosperity of its oil reserves and outside investment in the country. However, this will be difficult to fully realize without greater transparency of the government and a dramatic reduction in corruption with the government and its agencies.

7. Needs Summary

- Work with neighboring countries of Gabon, Nigeria, and Cameroon to settle boundary issues
- Infrastructure revitalization issues: Coordinate and administer the execution of oil revenue to build needed facilities.
- Unit training with the police and government officials, focused on changing culture of corruption

I. AN ANALYSIS OF GABON

1. Geography[309]

Total Area:	103,347 square miles
Ports:	Gamba, Libreville, Lucinda, Owendo, Port-Gentil
Coastal Features:	885 kilometers of coastline
Terrain:	Narrow coastal plain; hilly, heavily forested interior (about 80% forested); some savanna regions in east and south
Climate:	Hot and humid all year with two rainy and two dry seasons

The ports of Libreville and Port-Gentil are the only ports which can be used by merchant traffic. Port-Gentil is an oil terminal and has modern facilities. Gabon has some environmental issues, namely poaching and deforestation. Fortunately, because of

309. Bureau of African Affairs, "Background Note: Gabon," U.S. Department of State, http://www.state.gov/r/pa/ei/bgn/2826.htm.

Gabon's offshore oil reserves the majority of its rainforests have not been preserved in pristine condition.[310]

2. Economy311

GDP (2006):	$7.052 billion
GDP growth rate (2006):	2.8%
Per Capita Income (2006):	$7,100
Natural Resources:	Petroleum (43% of GDP), timber, manganese, uranium
Agriculture (2006):	5.9% of GDP, Products: coffee, coca, rubber, pineapples, sugar
Industry (2006):	59.7% of GDP
Services (2006):	25% of GDP
Trade (2002):	Exports $6.677 billion: petroleum, wood, manganese.
Major Markets:	United States (53%), China (8.5%), France (7.4%)
Imports:	Construction equipment, machinery, food, automobiles, manufactured goods.
Major Partners:	France (43%), U.S. (6.3%), U.K. (5.8%) Netherlands (4%)

Gabon receives 65% of its revenue from oil, of which it exports 81%. Unfortunately, the profits from this lucrative resource have been poorly spent over the years, resulting in a country deep in debt to the Central Bank and under scrutiny from the IMF. Oil reserves seem to be on the decline as oil production has declined rapidly over the years from Gabon's peak production year of 1997; however there has been little planning or resource management for the future after oil. There are only a few private investors in Gabon, while the majority of the businesses are government controlled. The World Bank and IMF have worked with the government to privatize more of the industries it controls as well as improving worker wages and employment.

310. The World Fact book, "Gabon," U.S. Central Intelligence Agency, https://www.cia.gov/library/publications/the-world-factbook/geos/gb.html.

311. Bureau of African Affairs, "Background Note: Gabon," U.S. Department of State, http://www.state.gov/r/pa/ei/bgn/2826.htm.

3. Political[312]

Government Type:	Republic, strong central government, led by president. President is chief of state, with a re-electable seven year term. The Prime Minister is head of government.
Structure:	There are a number of political parties, but one holds the most seats in the legislature and the Presidency, Parti Democratique Gabonais (PDG). There is an Executive, Legislative, and Judicial branch. The Legislative branch is made up of a 91-member Senate and a120-member National Assembly.
U.S. Relations:	U.S.-Gabonese relations are excellent; the last visit by the President of Gabon to Washington was in 2004. The U.S. military interacts with the Gabonese military through an International Military Education and Training program.

Despite election irregularities in the past six presidential and legislative elections, Gabon has made steady progress towards privatization of business, and formerly government run entities such as the press. The U.S. imports the majority of Gabon's export oil and exports heavy construction equipment, aircraft, and machinery to Gabon. Considerable private U.S. capital has been invested in Gabon since before its independence in 1960. The official language of Gabon is French, Fang, Myene, Bateke, Bapounou/Eschira, and Bndjabi are also spoken.

4. Social[313]

Religion:	Christian 55-75%, Islam (less than 1%), Animist
Population:	1,454867 (2007) composed of 7 ethnic groups
Literacy rate:	63%

312. Bureau of African Affairs, "Background Note: Gabon," U.S. Department of State, http://www.state.gov/r/pa/ei/bgn/2826.htm.

313. Bureau of African Affairs, "Background Note: Gabon," U.S. Department of State, http://www.state.gov/r/pa/ei/bgn/2826.htm.

Health:	Infant mortality rate (2007) 5.4%, Life expectancy (2007) 54 years, AIDS (2003) 48,000 people infected, 8.1% of population. Infectious diseases: *food or waterborne diseases:* bacterial diarrhea, hepatitis A, and typhoid fever, *vector borne disease:* malaria[314]
Work Force:	Agriculture 52%, Industry and commerce 16%, services and government 33%

Gabon is one of the least populated countries in Africa and labor shortages are the major impediment to economic growth. AIDS is prevalent in 8.1%, and there is a low infant birthrate, and a relatively high infant mortality rate. Due to its low population and relatively large land mass, Gabon has not disturbed the majority of its rain forests and remains rich in natural resources other than oil.

5. Transnational Issues[315]

There is currently an issue that has been a point of conflict for some time between Equatorial Guinea and Gabon to resolve the sovereignty dispute over Gabon-occupied Mbane Island and lesser islands and to establish a maritime boundary in hydrocarbon-rich Corisco Bay.

Gabon does not have a significant number of refugees from neighboring countries. Only a small number of refugees from the Republic of Congo (7,298) reside in Gabon as of 2006.

6. Comments

The country of Gabon is one of the more prosperous and stable countries in Africa. Although political conditions could improve, a small population, abundant natural resources, and considerable foreign support have shaped Gabon positively.

314. The World Fact book, "Gabon," U.S. Central Intelligence Agency, https://www.cia.gov/library/publications/the-world-factbook/geos/gb.html.

315. The World Fact book, "Gabon," U.S. Central Intelligence Agency, https://www.cia.gov/library/publications/the-world-factbook/geos/gb.html.

7. Needs Summary

- Coordination to resolve sovereignty dispute with Equatorial Guinea.
- Train with Coast Guard of Gabon to protect oil transportation
- Medical treatment and prevention training for common disease and AIDS.

J. AN ANALYSIS OF REPUBLIC OF THE CONGO

1. Geography[316]

Total Area:	342,000 square miles (slightly larger than New Mexico)
Major Cities/Capital:	*Brazzaville*, Pointe-Noire, Dolisie
Ports:	Brazzaville, Djeno, Impfondo, Ouesso, Oyo, Pointe-Noire[317]
Coastal Features:	105 miles of coastline[318]; coastal plains.
Climate:	Tropical

The Congo River forms the southeastern border of the country, and is the thoroughfare upon which Brazzaville lies. Pointe-Noire, an Atlantic seaport, "is the main commercial centre [sic] of the country,"[319] and has a rail connection to Brazzaville.

2. Economy[320]

DP (2006):	$5.093 billion
GDP growth rate (2006):	6%
Per capita (2006):	$1400 [321]

316. Bureau of African Affairs, "Background Note: Democratic Republic of the Congo," U.S. Department of State, http://www.state.gov/r/pa/ei/bgn/2823.htm.

317. The World Fact book, "Democratic Republic of the Congo," U.S. Central Intelligence Agency, https://www.cia.gov/library/publications/the-world-factbook/geos/cg.html.

318. The World Fact book, "Democratic Republic of the Congo," U.S. Central Intelligence Agency, https://www.cia.gov/library/publications/the-world-factbook/geos/cg.html.

319. Wikipedia, "Pointe Noire," http://en.wikipedia.org/wiki/Pointe-Noire.

320. Bureau of African Affairs, "Background Note: Democratic Republic of the Congo," U.S. Department of State, http://www.state.gov/r/pa/ei/bgn/2823.htm.

Natural Resources:	Petroleum, wood, potash, lead, zinc, uranium, phosphates, natural gas, hydropower.
Agriculture:	Manioc, sugar, rice, corn, peanuts, vegetables, coffee, cocoa, forest products. Less than 2% of land cultivated.
Trade (2006):	Exports $5.996 billion: petroleum (89%), lumber, plywood, sugar, cocoa, coffee, diamonds.
	Imports $1.964 billion: capital equipment, construction materials, foodstuffs.
Major Markets:[322]	Export: US 38.1%, China 33.3%, Taiwan 10.2%, South Korea 6.2% (2006).
	Import: France 23.5%, China 13.1%, US 7.5%, India 6.9%, Italy 5.6%, Belgium 5.1% (2006)

Though its traditional oil production on land is expected to wane in the next 15 years, the Republic of the Congo is pursuing offshore permits as part of a Production Sharing Agreement with the Democratic Republic of Congo. The country has made several economic during the recent years of peace, garnering favorable approval from the IMF. In 1997, their government "ratified a bilateral investment treaty [with the U.S.] designed to facilitate and protect foreign investment … [however] high costs of labor, energy, raw materials, and transportation; a restrictive labor code; low productivity and high production costs; and a deteriorating transportation infrastructure have been among the factors discouraging investment."[323]

321. The World Fact book, "Democratic Republic of the Congo," U.S. Central Intelligence Agency, https://www.cia.gov/library/publications/the-world-factbook/geos/cg.html.

322. The World Fact book, "Democratic Republic of the Congo," U.S. Central Intelligence Agency, https://www.cia.gov/library/publications/the-world-factbook/geos/cg.html.

323. Bureau of African Affairs, "Background Note: Democratic Republic of the Congo," U.S. Department of State, http://www.state.gov/r/pa/ei/bgn/2823.htm.

3. Political[324]

Government Type:	Republic
Structure:	Executive: president
	Legislative: Senate and National Assembly
U.S. Relations:	Relations between the United States and President Denis Sassou-Nguesso are strong, positive, and cooperative.

Though not a Cold War battleground, strong Marxist-Leninist language used by its government during that period, as well as spurious periods of conflict for political power, made relations with the Republic of the Congo difficult for many years. However, since the first progress toward democratization in 1991, especially since the relatively prolonged peace since 2003 (when the last rebel group signed a peace accord), and due to the political and economic reforms made by their president, genuine efforts are being made by its government toward stability.

4. Social[325]

Religion:	Christian 50%, Animist 48%, Muslim 2%
Population:	3,800,610; Kongo 48%, Sangha 20%, M'Bochi 12%, Teke 17%, Europeans and other 3%
Literacy rate (2003):	83.8%
Health:	Infant mortality rate 8.3%, Life expectancy 53.3 years
	AIDS 4.9% (2003 est.) adult population

"Estimates for this country explicitly take into account the effects of excess mortality due to AIDS; this can result in lower life expectancy, higher infant mortality

324. Bureau of African Affairs, "Background Note: Democratic Republic of the Congo," U.S. Department of State, http://www.state.gov/r/pa/ei/bgn/2823.htm.

325. The World Fact book, "Democratic Republic of the Congo," U.S. Central Intelligence Agency, https://www.cia.gov/library/publications/the-world-factbook/geos/cg.html.

and death rates, lower population and growth rates, and changes in the distribution of population by age and sex than would otherwise be expected (July 2007 est.)"[326]

5. Transnational Issues

Refugees, both from the Democratic Republic of Congo (over 56,000) and Rwanda (over 6,000), as well as from within its own borders (over 48,000), present the country with a large human-management challenge.[327]

6. Comments

The Republic of the Congo's strength lies in its willingness to reform economically and politically; yet it faces the great challenges of sustaining their future economy, fighting disease, and providing for displaced people. Their pursuit of alternatives in their oil production is a step in the right direction, as they seek to offset any future economic declines. Other options for prosperity and stability may lie in an improved (currently under-utilized) agriculture economy. The relatively prolonged peace there is encouraging.

Their maritime environment seems to center around future oil prospects, vice fishing. Though the catch has risen significantly over the past 30 years, "most fishing is carried on along the coast for local consumption."[328] Unlike most of its neighbors who side with international convention, the Republic of the Congo claims territorial seas to 200 miles. "The navy consists mainly of riverine craft but acquisition of offshore patrol vessels to protect offshore resources is a possibility."[329]

7. Needs Summary

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326. The World Fact book, "Democratic Republic of the Congo," U.S. Central Intelligence Agency, https://www.cia.gov/library/publications/the-world-factbook/geos/cg.html.

327. The World Fact book, "Democratic Republic of the Congo," U.S. Central Intelligence Agency, https://www.cia.gov/library/publications/the-world-factbook/geos/cg.html.

328. Encyclopedia of the Nations: Africa, "Congo, Republic of the (ROC)," http://www.nationsencyclopedia.com/Africa/Congo-Republic-of-the-ROC.html.

329. Jane's Fighting Ships, "Administration, Congo-Brazzaville," http://www4.janes.com.

- Offshore exploration
- Agricultural capital, investments
- Economic reform and management
- Build transportation infrastructure
- Naval material
- Improved healthcare
- Refugee management

K. AN ANALYSIS OF THE DEMOCRATIC REPUBLIC OF CONGO

1. Geography[330]

Total Area:	905,063 square miles (about the size of the U.S. east of the Mississippi)
Major Cities/Capital:	*Kinshasa*
Ports:	Banana, Matadi
Coastal Features:	23 miles of coastline[331], tropical rainforest near coastline, Congo River and Delta.
Climate:	Equatorial

The Congo River and its delta region comprise the primary maritime domain for the Democratic Republic of Congo. A small stretch of coastline marks a limited geographic border with the Gulf of Guinea. The port town of Banana (and associated oil terminal) is the closest access to the coast, located just inside the mouth of the Congo River. Matadi marks the furthest point on the Congo navigable by seagoing ships[332], is a

330. Bureau of African Affairs, "Background Note: Democratic Republic of the Congo," U.S. Department of State, http://www.state.gov/r/pa/ei/bgn/2823.htm.

331. The World Fact book, "Democratic Republic of the Congo," U.S. Central Intelligence Agency, https://www.cia.gov/library/publications/the-world-factbook/geos/cg.html.

332. Urbain Ureel, "(Belgian) Congo River Shipping at the End 19th and Beginning 20th Century," Urbain's Nautical Page, http://users.pandora.be/urbiehome/Congoship.html.

railhead for transportation further inland, and is considered the country's chief sea-port,[333] located 92 miles upriver. The navigable depth to Banana is around 5 m.[334]

2. Economy[335]

GDP (2003):	$5.6 billion
GDP growth rate (2005):	6%
Per capita (2005):	$120
Natural Resources:	Copper, cobalt, diamonds, gold … petroleum, wood.
Agriculture:	Coffee, rubber …
Trade (2002):	Exports $1.04 billion: diamonds, cobalt, coffee, petroleum. Imports $1.216 billion: consumer goods, capital equipment, refined petroleum.
Major Markets:	European Union, Japan, South Africa, U.S.

"Sparsely populated in relation to its area, the Democratic Republic of the Congo is home to a vast potential of natural resources and mineral wealth. Nevertheless, the D.R.C. is one of the poorest countries in the world … [a] result of years of mismanagement, corruption, and war."[336]

Agriculture may be the hardest hit of all the markets, as former President Mobutu's nationalization of international agricultural capital within the country's borders in the early 1970s "had a disastrous effect on production."[337] They have never really recovered, as conflict and instability in the country's interior - as well as a focus on more lucrative cash crops and mining – have thwarted any major increases in production and use of land. Over half of the Democratic Republic of Congo's land is farmable, yet only

333. Wikipedia, "Matadi," http://en.wikipedia.org/wiki/Matadi.

334. Wikipedia, "Banana, Democratic Republic of Congo," http://en.wikipedia.org/wiki/Banana%2C_Congo.

335. Bureau of African Affairs, "Background Note: Democratic Republic of the Congo," U.S. Department of State, http://www.state.gov/r/pa/ei/bgn/2823.htm.

336. Bureau of African Affairs, "Background Note: Democratic Republic of the Congo," U.S. Department of State, http://www.state.gov/r/pa/ei/bgn/2823.htm.

337. WashingtonPost.com, "International Spotlight: Democratic Republic of Congo, Food for Thought," http://www.washingtonpost.com/wp-adv/specialsales/spotlight/congo/food.html.

1 to 2 percent is currently farmed (2001 est.).[338] One of the greatest hurdles to effective agriculture is a lack of transportation infrastructure – in other words, the ability to transfer produce from farm to market. In essence, a resource for sustainment of the nation's people, as well as a source of revenue via export, is grossly under-utilized.

The Washington Post cites two other resources as potential means for increased revenue in the Democratic Republic of Congo: fishing and timber. It is estimated that the country has the potential to increase fish production (both fresh and saltwater) from 200,000 tons per year to over 700,000 tons[339], yet the population continues to import the majority of their fish. In addition, the Democratic Republic of Congo's rain forests offer potential export utilization, comprising 6% of the world's (60% of Africa's) wooded areas.[340]

3. Political[341]

Government Type:	Republic, highly centralized
Structure:	President, Prime Minister, and a legislature comprised of 500 seats, representing 169 electoral districts.
U.S. Relations:	The United States remains a partner with the D.R.C. … and facilitated the signing of a tripartite agreement on regional security in the Great Lakes region between the D.R.C., Rwanda, and Uganda in October 2004

Formerly known as Belgian Congo, the Democratic Republic of Congo endured numerous seizures of power, political experimentations, conflict and violence since its independence was granted in 1960. The most common conflict has stemmed from

338. WashingtonPost.com, "International Spotlight: Democratic Republic of Congo, Food for Thought," http://www.washingtonpost.com/wp-adv/specialsales/spotlight/congo/food.html.

339. WashingtonPost.com, "International Spotlight: Democratic Republic of Congo, Food for Thought," http://www.washingtonpost.com/wp-adv/specialsales/spotlight/congo/food.html.

340. WashingtonPost.com, "International Spotlight: Democratic Republic of Congo, Food for Thought," http://www.washingtonpost.com/wp-adv/specialsales/spotlight/congo/food.html.

341. Bureau of African Affairs, "Background Note: Democratic Republic of the Congo," U.S. Department of State, http://www.state.gov/r/pa/ei/bgn/2823.htm.

outside interventions – sometimes at the request of inside forces seeking to gain power, such as Laurent Desire Kabila's coup-d'etat in 1996, backed by Rwandan troops. Such instability exacted a large human toll: "between August 1998 and April 2004 (when the bulk of the fighting occurred) 3.8 million people died in the DRC."[342]

Kabila's son, Joseph Kabila, succeeded his father as the President of the Democratic republic of Congo, and implemented measures for conflict resolution, democratization, and economic revitalization. Under his rule, foreign factions within the country's borders signed the Pretoria Accord in 2003, which called for the withdrawal of all foreign troops; though foreign militias continue to operate in the eastern portion of the country, all official state armies honored their governments' treaty. In 2006, the Democratic Republic of Congo held its first democratic elections, monitored by its own Independent Electoral Commission. Kabila won with 58% of the vote for President; in addition, "voters … also chose from among 9,709 legislative candidates to fill 500 seats in the National Assembly, representing 169 electoral districts."[343] In addition, he extended authority to the opposition, with "four vice presidents represent[ing] the former government, former rebel groups, and the political opposition."[344] Kabila's economic reforms reduced inflation rates, prompting approval of new credits by the World Bank.

4. Social[345]

Religion (2004):	Roman Catholic 50%, Protestant 20%, Muslim 10% …
Population (2004):	58 million composed more than 200 ethnic groups
Literacy rate (2004):	65.5%
Health (2004):	Infant mortality rate 9.5%, Life expectancy 49 years

342. Global Security.org, "Congo Civil War," http://www.globalsecurity.org/military/world/war/congo.htm.

343. Bureau of African Affairs, "Background Note: Democratic Republic of the Congo," U.S. Department of State, http://www.state.gov/r/pa/ei/bgn/2823.htm.

344. The World Fact book, "Democratic Republic of the Congo," U.S. Central Intelligence Agency, https://www.cia.gov/library/publications/the-world-factbook/geos/cg.html.

345. Bureau of African Affairs, "Background Note: Democratic Republic of the Congo," U.S. Department of State, http://www.state.gov/r/pa/ei/bgn/2823.htm.

AIDS 4.2% adult population[346]

"According to estimates made in 2000, 41.7% of the population has no schooling, 42.2% has primary schooling, 15.4% has secondary schooling, and 0.7% has university schooling."[347]

5. Transnational Issues

Most issues occur in the far eastern portion of the country, often as a consequence of problems in neighboring Rwanda. There is a large refugee concern, particularly following the genocide which occurred in Rwanda. Also, Rwandan militias and rebel groups remain a constant nuisance, even though Rwanda's army pulled out of country following the Pretoria Accord. Such rogue entities – both internal and external – directly threaten stabilization of the Democratic Republic of Congo's interior.

6. Comments

The Democratic Republic of Congo represents just the type of region in which goodwill and engagement may prevent future political tensions and regional instability. Perhaps of foremost importance is the political reform toward democratization taking place there today – as well as its vulnerability to traditional internal and transnational threats lingering within and just outside of its borders. Unlike the Democratic Republic of Congo's neighboring states, oil is not the prime source of revenue, making its economic issues unique within the region. Its lands and waters promise hope in the form of expanded agriculture, fishing, and timber ventures, both for internal stability and international trade. Perhaps the following quote regarding agriculture best conveys the challenge for the entire country: "Government faces a mammoth task in making both the people of DRC and foreign investors regain confidence in agriculture as a viable

346. The World Fact book, "Democratic Republic of the Congo," U.S. Central Intelligence Agency, https://www.cia.gov/library/publications/the-world-factbook/geos/cg.html.

347. Bureau of African Affairs, "Background Note: Democratic Republic of the Congo," U.S. Department of State, http://www.state.gov/r/pa/ei/bgn/2823.htm.

economic activity."[348] Without an improved transportation system, or with a breach of its recent political calm, all hope for this nation could be lost yet again, thus insuring instability in this microcosm of the Gulf of Guinea region. Due both to its current progress toward a stable government and economy, and also due to its fragility at such an early stage, the Democratic Republic of Congo deserves the type of assistance that GFS may offer … soon.

From a maritime perspective, its small coastline might cause some to forego any sincere analysis of how improvements to its maritime governance might benefit the country; however, their coastline entitles them to exclusive rights to the economic use of 4,600 square miles of ocean. If significant mineral deposits or fisheries were discovered here, it might afford some revenue for their population. In addition, maritime regime implementation and enforcement may need to be bolstered: "The 2002 edition of Jane's Sentinel described the Navy as being 'in a state of near total disarray' and stated that it did not conduct any training or have operating procedures."[349] The Democratic Republic of Congo has been party to maritime treaties, however, as country representatives "signed a communiqué for a six-point action plan aimed at improving maritime security in the Gulf of Guinea at a US-led conference in Cotonou, Benin on 15 November 2006."[350]

7. Needs Summary

- Border security
- Agricultural capital, investments
- Exploration of offshore oil prospects

348. WashingtonPost.com, "International Spotlight: Democratic Republic of Congo, Food for Thought," http://www.washingtonpost.com/wp-adv/specialsales/spotlight/congo/food.html.

349. Wikipedia, "Military of the Democratic Republic of Congo," http://en.wikipedia.org/wiki/Military_of_the_Democratic_Republic_of_the_Congo#Congolese_Navy.

350. Denise Hammick, "African countries sign U.S.-led plan for better security in the Gulf of New[sic] Guinea, " http://www4.janes.com/subscribe/jni/doc_view.jsp?K2DocKey=/content1/janesdata/mags/jni/history/jni2006/jni70586.htm@current&Prod_Name=JNI&QueryText=%3CAND%3E%28%3COR%3E%28%28%5B80%5D%28+hammick+%3CAND%3E+african%29+%3CIN%3E+body%29%2C+%28%5B100%5D+%28%5B100%5D%28+hammick+%3CAND%3E+african%29+%3CIN%3E+title%29+%3CAND%3E+%28%5B100%5D%28+hammick+%3CAND%3E+african%29+%3CIN%3E+body%29%29%29%29.

- Exploration of fishing prospects
- Timber capital, investments
- Maritime regime building
- Enforcement of EEZ
- Security of its people (particularly in the East)
- Transportation infrastructure building

L. AN ANALYSIS OF ANGOLA

1. Geography[351]

Total Area:	1,246,700 square miles (about twice the size of Texas)
Major Cities/Capital:	*Luanda*, Huambo, Benguela
Ports:	Cabinda, Soyo, Luanda, Lobito, Benguela, Namibe
Coastal Features:	994 miles of coastline[352]; narrow dry coastal strip from Luanda to Namibia; tropical rainforest elsewhere along the coast, including the enclave of Cabinda.
Climate:	Tropical

The primary ports are Luanda, Lobito, Malongo and Namibe. To provide a picture of port capacity, Luanda – the country's second busiest port – has four terminals, a pier-side depth of 9.5 m, and faces congestion problems (see picture below), sometimes requiring ships to delay for 21 days.[353] Lobito is the country's other "deepwater seaport." Malongo, Soyo and Namibe are listed as "small" or "very small."[354]

351. U.S. Department of State, "Background Note: Angola," http://www.state.gov/r/pa/ei/bgn/6619.htm.

352. The World Fact book, "Angola," U.S. Central Intelligence Agency, https://www.cia.gov/library/publications/the-world-factbook/geos/ao.html.

353. OT Africa Line, "Luanda Port Information," http://www.otal.com/angola/index.htm#luanda.

354. World Port Source, "Countries: Angola," http://www.worldportsource.com/ports/AGO.php.

2. Economy[355]

GDP (2006): $53.9 billion

GDP growth rate (2006): 15.3%

Per capita (2006): $3,399

Natural Resources:	Petroleum, diamonds, iron ore, phosphates, bauxite, uranium, gold, granite, copper, feldspar.
Agriculture:	Bananas, sugarcane, coffee, sisal, corn, cotton, manioc, tobacco, vegetables, plantains; livestock; forest products; fisheries products.
Trade (2006):	Exports $30.3 billion: petroleum (95%), diamonds (4.6%), coffee …
	Imports $9 billion: machinery, electrical equipment, vehicles and spare parts, medicines, foods, textiles.
Major Markets:	Portugal, U.S., South Africa, China, Brazil.

The economy in Angola is booming, largely due to its offshore oil revenue (second only to Nigeria); however, reformation to address economic issues born out of 27 years of civil war on land is slow. Though once a major economic force, agriculture suffered as a consequence of landmines placed in the countryside, and "the country now imports about half of its food."[356] Angola's second highest grossing industry, diamond mining, is plagued by illegal sales from small-scale prospectors, though the government "is making an increased effort to register [them],"[357] and corporate ownership is increasing. According to the IMF, more than $4 billion worth of oil receipts remain unaccounted for from their treasury for a six-year period.[358]

355. Bureau of African Affairs, "Background Note: Angola," U.S. Department of State, http://www.state.gov/r/pa/ei/bgn/6619.htm.

356. Bureau of African Affairs, "Background Note: Angola," U.S. Department of State, http://www.state.gov/r/pa/ei/bgn/6619.htm.

357. Bureau of African Affairs, "Background Note: Angola," U.S. Department of State, http://www.state.gov/r/pa/ei/bgn/6619.htm.

358. Bureau of African Affairs, "Background Note: Angola," U.S. Department of State, http://www.state.gov/r/pa/ei/bgn/6619.htm.

3. Political[359]

Government Type:	Republic
Structure:	Executive: elected president, appointed prime minister Legislative: elected National Assembly
U.S. Relations:	The United States established formal diplomatic relations with the Government of Angola in 1993. Before 1989, U.S.-Angolan relations were defined by the Cold War. In May 2004, President Dos Santos met with President Bush during an official visit to Washington.

Gaining independence from Portugal in 1975, Angola didn't emerge from its status as a hot-bed for Cold War conflict until "a U.S.-brokered agreement resulted in withdrawal of foreign troops in 1989 and led to the Bicesse Accord in 1991, which spelled out an electoral process for a democratic Angola under the supervision of the United Nations."[360] This process went into effect in 1992, with the first democratic elections. Jose Eduardo dos Santos, a leader within the Popular Movement for the Liberation of Angola (MPLA) which was backed by the Soviets during the Cold War, won. By 1994, hostilities between old Cold War factions ceased. President dos Santos retains much authority from his executive office, and has postponed the next presidential election until 2009.

Internal revolt remains a threat to Angolan governance in an enclave known as Cabinda – a region which accounts for a large percentage of Angolan oil, but which is also physically separated from the mainland by the Democratic Republic of Congo. The most notable opposition to the Angolan government here is the Front for the Liberation of the Enclave of Cabinda (FLEC); however, their resistance has waned since a

359. Bureau of African Affairs, "Background Note: Angola," U.S. Department of State, http://www.state.gov/r/pa/ei/bgn/6619.htm.

360. Bureau of African Affairs, "Background Note: Angola," U.S. Department of State, http://www.state.gov/r/pa/ei/bgn/6619.htm.

Memorandum of Understanding was signed in 2006, and many of their members have assimilated into the Angolan Army. Still, there is an active element to FLEC.

4. Social[361]

Religion (1998):	Indigenous beliefs 47%, Roman Catholic 38%, Protestant 15%
Population (2007):	12,263,596 million, composed mostly of three primary ethnic groups
Literacy rate (2001):	67.4%
Health:	Infant mortality rate 18.4%, Life expectancy 37.6 years AIDS 3.9% adult population

Angola "ranks in the bottom 10% of most socio-economic indicators … [and was] ranked 161 out of 177 countries on the 2006 UN Development Program's Human Development Index."[362]

5. Transnational Issues

Over 13,000 refugees from the Democratic republic of Congo remained in country as of 2006. A lingering effect of the long civil war in Angola includes the 61,700 (2006 est.) internationally displaced persons (IDPs).[363] Angola is also utilized by drug smugglers as a staging point for cocaine shipments to Europe. In addition, due to the underlying animosity of Cabindans toward Angola, DR. J. Peter Pham has hinted that the remaining active FLEC revolutionaries in this enclave might be just the kind of group to conspire with international terrorist organizations, such as Al Qaeda, to further their cause: "If Osama bin laden is serious about waging economic war against the United States … and if his minions heed his advice about hitting one of America's vital arteries,

361. The World Fact book, "Angola," U.S. Central Intelligence Agency, https://www.cia.gov/library/publications/the-world-factbook/geos/ao.html.

362. Bureau of African Affairs, "Background Note: Angola," U.S. Department of State, http://www.state.gov/r/pa/ei/bgn/6619.htm.

363. The World Fact book, "Angola," U.S. Central Intelligence Agency, https://www.cia.gov/library/publications/the-world-factbook/geos/ao.html.

then we can expect at some point a maritime threat, most likely to West African production facilities."[364]

6. Comments

Angola possesses the economic power to afford stability, but concerns about its government, as well as the great disparity between the wealth of the nation and the poor social conditions of its people, present a difficult socio-political environment in which to engage. An 18% infant mortality rate is one example of such disparity. Indeed, the disparity between the social and economic spectrums may be due in part to the short period of peace in which they have been able to merge; they may simply need more time.

The political realm remains intriguing: President dos Santos's delay of presidential elections until 2009 raises suspicion regarding the democratic legitimacy of its governmental charters; however, he has been engaged with the U.S., and has extended political goodwill across "party" lines to members of former Cold War enemies by including them in the National Assembly. Further reform will benefit the nation: "Angola will need to implement government reforms and to reduce corruption … [in order] to fully take advantage of its rich national resources - gold, diamonds, extensive forests, Atlantic fisheries, and large oil deposits."[365]

The maritime environment of Angola is large, and they are taking advantage of their exclusive rights to 200 miles with their offshore oil drilling. Their Navy, the People's Navy of Angola (Marinha de Guerra Popular de Angola - MGPA), is the smallest component of their armed forces, with a strength of 1,500 to 2,000 servicemen[366] and comprised of "a fleet of about fifty vessels that [include] guided-missile fast patrol boats, torpedo boats, inland water and coastal patrol vessels, mine

364. Peter J. Pham, "Cabinda: The "Forgotten Conflict" America Can't Afford to Forget," *World Defense Review*, http://worlddefensereview.com/pham070507.shtml.

365. The World Fact book, "Angola," U.S. Central Intelligence Agency, https://www.cia.gov/library/publications/the-world-factbook/geos/ao.html.

366. Institute for Security Studies, "Angola: Security Information," http://www.iss.co.za/AF/profiles/Angola/SecInfo.

warfare craft, and amphibious landing craft."[367] Their mission in peacetime may extend beyond security. In 1985, the MPGA took over fisheries enforcement from their coast guard "to provide more effective enforcement of fishing regulations."[368] There are indications that Angolan armed forces are involved in reconstruction efforts, as well. Proficiency and vessel maintenance were described as "problematic" in 1989, but this information is dated. Indeed, the vast ocean expanse within their EEZ may require more material and personnel needs than their small force currently possesses.

Relations with Angola are warm enough for interaction; indeed, the U.S. economy is directly tied to those relations as they are a major producer of our own nation's oil needs. The U.S. has already taken action to assist with economic reform, providing "$2.2 million to work on land tenure, economic policy, and the financial sector."[369] Further engagement may help in their government's continuing evolution from a war-torn nation to a well-rounded political, social, and economic force of stability in the Gulf of Guinea region.

7. Needs Summary

- Offshore oil protection
- Agricultural capital, investments
- Economic reform and management
- Improved healthcare
- Naval maintenance
- Naval equipment/vessels
- Refugee management
- stop drug-smuggling
- Enforce fisheries

367. Photius Coutsoukis, "Angola Navy," http://www.photius.com/countries/angola/national_security/angola_national_security_navy.html.

368. Photius Coutsoukis, "Angola Navy," http://www.photius.com/countries/angola/national_security/angola_national_security_navy.html.

369. Bureau of African Affairs, "Background Note: Angola," U.S. Department of State, http://www.state.gov/r/pa/ei/bgn/6619.htm.

M. AN ANALYSIS OF SAO TOME AND PRINCIPE

1. Geography[370]

Total Area:	1,001 sq. km.; one-third size of Rhode Island
Major Cities/Capital:	Sao Tome
Ports:	Cotonou
Coastal Features:	209 km
Climate:	tropical; hot, humid; one rainy season
Port Information:	No deep water harbors.[371]

2. Economy[372]

GDP (205 est.):	$ 71.38million
GDP growth rate (2006 est.):	4.4%
Per capita (2005 est.):	$424
Natural Resources:	Agricultural products, fish, oil
Agriculture:	Cocoa, coconuts, copra, palm kernels, cinnamon…
Trade (2006 est.):	Exports $9.773 million: cocoa copra, palm kernels
	Imports $48.87 million: food, fuel, machinery and electrical equipment
Major Markets:	Portugal, Netherlands, Spain, Germany, China

Majority of Sao Tome and Principe economy is based on cocoa which accounts for 95% of total exports. Domestic food production is inadequate, so the country imports some of its food.

Sao Tome and Nigeria have reached an agreement on joint exploration for oil in the waters claimed by both countries.

370. Bureau of African Affairs, “Background Note: Sao Tome and Principe,” U.S. Department of State, http://www.state.gov/r/pa/ei/bgn/5434.htm.

371. Sao Tomé e Príncipe, "Paradise islands on the equator - heaven for individualists," http://www.sao-tome.com/englisch/index.htm.

372. Bureau of African Affairs, “Background Note: Sao Tome and Principe,” U.S. Department of State, http://www.state.gov/r/pa/ei/bgn/5434.htm.

Togo has turned to the IMF, Africa Development Bank (ADB) and World Bank for economic reform and debt relief, specifically under the Heavily Indebted Poor Countries (HIPC) Initiative and Poverty Reduction and Growth Facility (PRGF) program.

3. Political373

Government Type:	Republic
Structure:	President and Prime Minister; legislative-national assembly; Judicial-supreme court
U.S. Relations:	Sao Tome and Principe has excellent relations with the U.S.

4. Social[374]

Religion (2001):	Catholic 70.3%, none 19.4%Evangelical 3.4%, New Apostolic 2%
Population (2007 est.):	199,570
Literacy rate (2004):	84.9%
Health (2003 est.):	Life expectancy 66.03 years HIV/AIDS Prevalence: N/A HIV/AIDS, people living with: N/A Major Diseases: hepatitis A and typhoid fever

373. Bureau of African Affairs, "Background Note: Sao Tome and Principe," U.S. Department of State, http://www.state.gov/r/pa/ei/bgn/5434.htm.

374. The World Fact book, "Sao Tome and Principe," U.S. Central Intelligence Agency. https://www.cia.gov/library/publications/the-world-factbook/geos/tp.html.

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APPENDIX B: FNA PLATFORM SELECTION PROPOSALS

Platforms highlighted in red signify SEA-12's selections for evaluation in FNA.

The following summaries are the notes taken during the selection process, and highlight the key considerations given to each proposal.

CVN

Pros	Cons
Comms Suite Air Wing Time on Station Medical capability	Draft National Asset

Figure 101: CVN "Pros & Cons"

CG

Pros	Cons
Surface Detection Time on Station O-6 Lots in current inventory Helicopters Fuel considerations 2 RHIB's	Lack of storage National Asset Lack of storage capacity Lack of extra berthing Minimal off load capability Draft (?)

Figure 102: CG "Pros & Cons"

FFG

Pros	Cons
Smaller draft Tons of them Independent steaming 2 Helos	Cargo capacity Berthing Comm Suite

Figure 103: FFG "Pros & Cons"

DDG

Pros	Cons
Water making capacity 2A has helos Comm Suite	Not 2A's no helos Draft Time on station National Asset Cargo capability

Figure 104: DDG "Pros & Cons"

LHD

Pro's	Cons
Air wing Water making LCAC Cargo Capacity Comm Suite Berthing capacity On Station Time	Can't support VBSS/MIO Transit Speed National Asset Limited in number Draft

Figure 105: LHD "Pros & Cons"

LPD-17

Pro's	Cons
Comm suite Helos LCUs (well deck) Transit Speed	Still really new (bugs) Draft

Figure 106: LPD-17 "Pros & Cons"

LHA

Pro's	Cons
Same as LHD	Old (going away) Draft

Figure 107: LHA "Pros & Cons"

LSD

Pro's	Cons
Well Deck capacity (LCUs/LCAC) Comm Suite	Old

Figure 108: LSD "Pros & Cons"

AS

Pro's	Cons
Cargo Space Repair Capability Crane capability Small boat ops Auxiliary Ship (not warship) Diminishing tasking Medical capability Classroom space	Helos Old Slow Only 2

Figure 109: AS "Pros & Cons"

RORO or General Cargo

Pro's	Cons
Size Cargo capability Not warship Off load capability Civilian crew Off load capability On station time Less maintenance requirements Many available Fast Adaptability	No military operations Berthing Draft (Size)

Figure 110: RORO "Pros & Cons"

Hospital Ship (HS)

Pro's	Cons
Floating hospital Storage capacity (?) Civilian manning Military doctors	On-load off/load capability Only have 2 No helos Draft Cannot get stuff ashore

Figure 111: HS "Pros & Cons"

PC (Cyclone Class)

Pro's	Cons
Shallow Draft Not warship	Transitioned to USCG (?)

Figure 112: PC "Pros & Cons"

LCS

Pro's	Cons
Future of the Navy Modular Shallow draft Helos Comms Suite Cross trained crews	Program challenges (?) Funding cuts Ready to go in 2012 (?) Time on station

Figure 113: LCS "Pros & Cons"

HSV

Pro’s	Cons
Cargo capacity Speed Draft RORO capability Helo pad Classroom Space	Might not be available in 2012 No organic helo Limited cross Atlantic cargo

Figure 114: HSV "Pros & Cons"

USCG (Cutter or Tender)

Pro’s	Cons
Experience Similar to HN navies Not perceived as warship Self Defense	Not DoN (however, some question whether this is a “con”)

Figure 115: USCG "Pros & Cons"

USCG & RORO

Pro’s	Cons
Non-warship perception Compliment each others weaknesses Comm Suite Surface search CG experience No impact on USN fleet	

Figure 116: USCG & RORO Combination "Pros & Cons"

HSV & RORO

Pro’s	Cons
HSV can go where RORO can’t Adaptable Cargo space on RORO	

Figure 117: HSV & RORO Combination "Pros & Cons"

FFG & LHD/LHA

Pro’s	Cons
Two USN assets LHD can refuel FFG Helo capability Off-load capability	

Figure 118: FFG & LHD/LHA Combination "Pros & Cons"

Hospital Ship (HS) and USCG

Pro's	Cons
Non-military CG experience Hospital	No USN (however, some question whether this is a "con") Interoperability Size of HS, and lack of connectors

Figure 119: HS and USCG Combination "Pros & Cons"

LCS & HSV

Pro's	Cons
Speed/Maneuverability Arming Both shallow draft	#'s of hulls available LCS mod's available Similar capabilities

Figure 120: LCS & HSV Combination "Pros & Cons"

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APPENDIX C: SIMULATION DETAILS

Peacetime Engagement – System Evaluation Scenario and Simulation Plan: Petroleum Infrastructure Security in the Gulf Of Guinea and Niger Delta

A. SYSTEM EVALUATION SCENARIO OVERVIEW

The purpose of this scenario is to provide a realistic context by which to evaluate GFS system alternatives within the specific mission area of Peacetime Engagement. For this reason, the scope of the scenario is limited to "testing" GFS-only capabilities and not those of partner agencies or nations; although it is assumed that the Interagency & NGO Coordination role is intrinsic and will be fulfilled to some extent. Neither does this scenario delve into the mission area of Humanitarian Assistance/Disaster Relief, although it may be a probable consequence of violent action in the Area of Operations (AO). Evaluation of GFS system alternatives is accomplished by first using the scenario to determine relative importance of GFS *attributes*, then developing appropriate measures of effectiveness for those attributes, and finally using the scenario as a basis for modeling, simulation and analysis in order to evaluate the performance of system alternatives (i.e. different platforms).

B. CONTEXT

The scenario is projected to be relevant through the year 2012 and is as follows: The GFS is midway through her second deployment to the Gulf of Guinea (GoG) Area of Operations (AO). She has been conducting multinational exercises with partner nations in the region, and is currently training with a Nigerian Navy vessel in the littoral region of the Niger Delta. Training topics may include small ship and engine maintenance, security of offshore and inshore petroleum infrastructure, conduct of EMIO and Counter Piracy Operations, fisheries protection, or border dispute resolution.

C. THREAT

The threat level has increased in the AO due to recent actions of the Movement for the Emancipation of the Niger Delta (MEND). A small MEND militia has boarded a Nigerian Shell Oil platform 25 Nautical Miles off the Niger Delta near Bonny Island and stolen hundreds of barrels of petroleum with a small coastal tanker (200-300 ft) and a swarm of 5 fast boats with small arms and rocket propelled grenades (RPGs). The militia has also kidnapped 3 of the Shell workers. It is uncertain whether the hostages are onboard the pirate tanker or one or more of the fast boats.

1. RED (MEND) Objectives

Red objectives are to force the powerful foreign oil companies from the Niger Delta Region. They also wish to end military rule, return Nigeria to a democratic civilian government, and the creation of new states in ethnic minority areas. These local terrorist organizations wish to increase local control and the share of money made from oil and natural resources.

For the purposes of this scenario, the MEND militia aims to transport the bunkered oil to another port and sell it on the black market, while the hostages are covertly exchanged back to Shell for a ransom. It is assumed that the fast boats mean to either escort the tanker or ferry the hostages to a covert location.

2. RED Phases

- COLLECT: Intelligence, surveillance, monitoring, and planning through local informants.
- SEIZE: Militants will then conduct high speed approach of oil platform or facility, board, and control platform.
- TRANSFER: Once onboard the platform, oil bunkering and/or kidnapping of foreign oil workers is initiated.
- ESCAPE: These activities are usually followed by ransom for exchange of workers and sale of bunkered oil on the black market.

3. RED Key Tasks in Support of Their Objectives

The Movement for the Emancipation of the Niger Delta (MEND) has used kidnapped foreign oil workers as a prime ransom tool against oil companies such as Shell. Well-armed militants take hostages from Delta oil platforms and demand excessive ransoms be paid to them for the safe return of the foreign workers. MEND militants have successfully cut the flow of oil by nearly 20% following these attacks.

Oil bunkering, an illegal activity where militarized youth groups tap into oil pipelines, has been occurring frequently since the late 1990s. This activity in conjunction with MEND bombings usually target key points in oil pipelines and facilities in the Delta to maximize disruption and cost to foreign oil companies.

4. RED Targets

Red targets include oil platforms, foreign oil workers, oil infrastructure, oil companies.

5. RED Capabilities

MEND militia can be expected to be armed with fully automatic machine guns on high speed boats while personnel routinely carry sub-machine guns. There are approximately 8 militants to each fast boat, and an unknown number on the small tanker. Militants also employ rocket propelled grenades and may deploy explosive devices on the oil platform. The following data is from the Terrorism Knowledge Base maintained by the Memorial Institute for the Prevention of Terrorism in Oklahoma City, Oklahoma.[375]

[375] Memorial Institute for the Prevention of Terrorism, *Terrorism Knowledge Base,* http://www.tkb.org/Home.jsp.

MILITIA/TERRORIST ORG	STRENGTH	ETHNITICY	OIL THEFT	LOCAL SUPPORT	POLITICAL INFLUENCE	ISR CAPABILITY	AO
Movement for the Emancipation of the Niger Delta (MEND)	UNK	Ijaw people of the Niger Delta	YES	YES	YES	YES; limited to local informants	NIGER DELTA
Iduwini Youths (AKA Ijaw Youth Movement)	UNK	Iduwini/Ijaw	NO; limited to kidnapping of oil employees	YES	YES	YES; limited to local informants	SOUTHERN NIGER DELTA
Movement for Development and Democracy (MDD)	More than 3,000 members	VARIOUS	UNK	YES	YES	UNK	Cameroon, Chad, Nigeria, Libya

Figure 121: Threat Organizations in Nigeria

D. KEY ASSUMPTIONS

1. The Nigerian Government

The Government of Nigeria is a Federal Republic which has had excellent relations with the U.S. since 1999, sharing many of the same foreign policy goals. United States interest in Nigeria is great, as it is the 5th largest supplier of American oil and we are heavily invested in their oil infrastructure (40% of Nigerian oil exports go to the US). Yet, poor corporate relations with indigenous communities, vandalism of oil infrastructure, ecological damage, and security problems in the Niger Delta region hamper growth and reliability of Nigeria's oil throughput.[376]

a. The Nigerian Navy

Reports at the time of this study indicate that Nigeria's naval forces are operating in disrepair with little to no materiel reserves and are repeatedly overpowered by militant forces. Furthermore, their warships are inadequately suited to operations in the Delta region.[377]

[376] U.S. Department of State, *Nigeria Profile*, Bureau of African Affairs (June 2007), http://www.state.gov/r/pa/ei/bgn/2836.htm.

[377] Kingley Omonobi, "Why We Suffer Casualties in N-Delta, By Naval Chief," *Vanguard* (Oct 4, 2007), http://allafrica.com/stories/printable/200710040219.html.

b. GFS Presence

It is our assumption that the Nigerian Government, acting through the Minister of Defense, welcomes the cooperative role of GFS and has extended an invitation to *train* and *operate* with the Nigerian Navy in territorial waters. Where the capabilities of host nation navies stop, GFS is tasked by AFRICOM to lead the ensuing operation in support of the Nigerian Navy's constitutional role. Nigerian naval officers may be present during the operation for training purposes. For more rationale, refer to section V-B.

2. The Region

The Niger River Delta is 20,000 square miles in size, and most of the 3,000 miles of aboveground pipelines crisscrossing the Delta are 30 years old and built to lower standards than modern pipes.

a. The Bonny River

The Bonny River is representative of critical traffic ways throughout the region. In 2005, 25% of all Nigerian-bound vessels trafficked the Bonny River; carrying 28% of total tonnage. The Port of Onne, midway between Port Harcourt and the sea on the Bonny River, handled 40% of this vessel traffic.[378]

b. Port Harcourt

Port Harcourt is a natural port, and maintains the status of being the third largest in the country. The port has an extensive range of handling equipment and provides a maximum draught of 7.6 meters. The port houses a main quay of 1,390 meters long – 13 berths, a dockyard with 5 mooring berths and tanker buoys.[379]

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[378] Nigerian Ports Authority, *Port Statistics*, http://www.nigerian-ports.net/normal/tools/statistics.html.

[379] Nigerian Ports Authority, *Port Harcourt*, http://www.nigerian-ports.net/normal/ports/portharcourt.html.

3. Regional Economic and Political Organizations

Regional economic and political organizations do not oppose the US military presence or operations in host nations. Such organizations include the Community of Sahel-Saharan States (CEN-SAD), Economic Community of Central African States (CEEAC/ECCAS), and Economic Community of West African States (ECOWAS).

4. The United Nations (UN)

The UN does not oppose the US military presence in or operations with host nations.

5. Terrorist Organization Status

Refer to section C-5. Assume that intelligence preparation of the battle space has reported a LOW terror-threat condition.

6. Closest Regional Base

The nearest regional base is located in Djibouti, and friendly states in the region provide any necessary over-flight permissions.

7. Riverine Operations

Any emphasis on the need for riverine forces should be interpreted as a recommendation only. For the purposes of this scenario, it should be assumed that the Nigerian riverine capability is the most appropriate response. Alternatively, we considered that the implications of U.S. Riverine Forces supported by GFS are beyond the scope of our study. Whether or not it is directly supported by GFS, riverine units will require coordination from GFS during counter piracy operations, assuming her draft is too deep to enter the smaller Delta tributaries. *However, use of U.S. riverine forces may imply an escalation in conflict level beyond the scope of GFS regional objectives.*

8. Air Threat

No threats exist to air lines of communication (ALOCs) leading into, but not within, the area of operation.

9. NEO Contingencies

The scale of this scenario will not require non-combatant evacuation (NEO).

E. PARTNERS

Indirect approaches to conflict call for a concerted effort to empower, enable, and leverage DoD's interagency and multinational strategic partners, rather than relying on direct and unilateral military confrontation by US joint forces. In order to achieve its objective by working with and through strategic partners, DoD must help build and continually monitor the capacity of those partners.

1. Non-DoD Agencies of the U.S. Government.

While GFS may include a Department of State or other non-DoD agency capacity on-board, for the purposes of this scenario, it is assumed that no direct assistance is available.

2. Nigerian Government, Military, and Police Forces

If this study is to truly measure U.S. capabilities between system alternatives, we cannot rely on host nation forces. Therefore, for the purposes of this scenario, it is assumed that while a coordination role will be in effect, negligible assistance will be provided by the Nigerian government other than explicit cooperation (see Part IV: Key Assumptions).

3. Coalition Partners

For the purposes of this scenario and estimation of BLUE force capability, assume no coalition involvement (see above).

4. IGOs

TBD; see above.

5. NGOs

In this case, we must emphasize the importance of working with NGOs that share the objective (and/or understand the importance) of regional stability, and not of jeopardizing it by working (perhaps unwittingly) into the plans of rebel forces due to a disregard for other considerations (political, "big picture," etc.). TBD; see above.

F. STRATEGIC CONCEPT IN THE GULF OF GUINEA

1. Broad Goals

- Create a safe and secure environment
- Foster economic stability, particularly the assurance of critical resource revenues to responsible national authorities
- Address basic infrastructure and humanitarian needs of the people
- Monitor for and decrease illegal trafficking
- Train host nation governments, military, and police forces to improve their own security operations.

2. Military Tasks

- Establish strategic communication
- secure and protect critical oil infrastructure
- provide for stability and enable civil authority
- employ ISR towards interdiction of "bunkered" oil and contraband shipments
- conduct Foreign Intelligence Operations
- train host nation forces to protect infrastructure and to conduct Maritime Security Operations
- conduct counterterrorism operations.

G. BLUE (GFS) COMPONENTS OF THE STRATEGIC CONCEPT

1. Approach

Ideally all military tasks would be accomplished in fulfillment of the broad goals outlined in Section VII above. However, GFS is envisioned as a short-term, small-scale solution to persistent problems. In support of its role in Shaping and Stability operations in the Gulf of Guinea, GFS is tasked to employ its organic capabilities against an act of militant piracy in Nigeria.

2. BLUE Objectives

- Deter illegal activity in the AO by intercepting, neutralizing, detaining, and transferring MEND militants to the Nigerian government.
- Promote regional relationships by acting as a command, control, and coordination (C3) hub and Regional Maritime Situational Awareness (RMSA) node for the recovery and return of hostages and bunkered oil to appropriate custody.
- Continue training of foreign navies in support of regional GFS objectives.

3. BLUE Phases

- TRAINING the Nigerian Navy in any number of capability areas.
- COORDINATE intelligence, surveillance, monitoring, and planning capabilities. 2) PURSUIT. It is not yet determined whether the fast boats escort the tanker or separate and flea into the Delta region.
- INTERCEPT the tanker. The tanker may steam upriver towards Port Harcourt or East/West along the coast to another port.
- ENGAGE and neutralize the tanker; engage the fast boats only if necessary for force protection.
- DETAIN RED crew members.
- TRANSFER detainees, hostages and recovered oil, and any wounded. Refuel and rotate personnel if necessary.

- RESUME normal operations (complete post-engagement actions and carry out standing orders).

4. BLUE Key Tasks

- As a potential member of the 1,000 ship navy, GFS must coordinate her efforts with regional partners.
- GFS will also serve as the C3 unit for the security of the oil platform. EOD may be needed to neutralize any explosives. As the lead C3 unit, GFS must decide whether to take down the tanker with a non-compliant VBSS team or the proven SEAL team. Either team can be fast-roped onto the platform from a helicopter detachment or be delivered via small boat (RHIB, SURC).
- Additionally, GFS will be prepared to conduct SUW against MEND small boats in the area.

5. BLUE Targets

Targets include oil platform, MEND tanker, MEND fast boats.

6. BLUE Capabilities

The preceding scenario is used as a context by which to determine important attributes of GFS. For a complete list of attributes see the *Functional Needs Analysis*. The attributes will be the focus of the modeling, simulation, and analysis effort.

H. ALTERNATIVE SCENARIOS

Beyond the "base case" of section III, alternative scenarios include those outlined in the Interagency & NGO Coordination and Humanitarian Assistance/Disaster Relief scenarios.

I. MODELING AND SIMULATION EFFORT

1. Overview

The purpose of the modeling and simulation effort is to evaluate the performance of GFS system alternatives (i.e. different platforms) in a given operational scenario. The scenario was first used to determine the relative importance of GFS *attributes* – for which we developed appropriate value scoring criteria – and finally to model and thereby simulate the operational environment.

2. Context

See accompanying documentation on the System Evaluation Scenario.

3. Value Scoring Criteria (VSC)

Peacetime Engagement attributes are listed with their scenario weight in parentheses and a brief summary of associated VSC. For more detailed descriptions of value scoring criteria, refer to the *Functional Needs Analysis*.

1.0.1	**Command, Control, Coordination (8)**
	- C3 Capability Level
1.0.2	**Regional Maritime Situational Awareness (8)**
	- Surveillance and Tracking (NSS)
	- Time to Detection (Ship)
	- Time to Detection (Helo)
	- Range to Detection (Ship)
	- Range to Detection (Helo)
1.1.1	**Small Boat Operations (7)**
	- Small Boat Op Capable? (Y/N)
	- Number of and type of organic small boat assets
1.1.2	**VBSS Team Support (8)**
	- Capacity to transport, house, sustain VBSS teams
1.1.3	**Sea, Air, Land (SEAL) Team Support (5)**
	- Capacity to transport, house, sustain detainees
1.1.4	**Equipment Storage (4)**
	- Cargo Capacity (small boats, VBSS & SEAL equipment)
	- Configured Armory? (Y/N)
1.1.5	**Medical Support and Transport (4)**
	- Onboard Medical Staff and Facilities
	- Transport Ability (Helos, platform speed)
1.1.6	**Detainee Coordination (6)**
	- Capacity to transport, house, sustain detainees
1.1.7	**Helicopter Operations (7)**
	- Helo Op Capable? (Y/N)
	- Number and type of Helos embarked/supported
	- Operational availability f(# helos)
1.2.1	**Force Protection (5)**
	- Survivability (organic weapons systems, maneuverability, hull composition, ship type, threat capability)
1.2.2	**Ordnance on Target (6)**
	- Surface Warfare capability (armament, maneuverability, overall design)
1.2.3	**Protection of SLOCs (3)**
	- Response capability, weapons systems, deterrence
1.2.4	**Riverine Operations (9)**
	- RivGroup C3 Hub Capable? (Y/N)
	- RivGroup C3 Craft Capable? (Y/N)
1.2.5	**Ocean/Hydro/River Survey & Support Operations (1)**
	- Capacity to embark NOAA personnel and conduct surveys
1.2.6	**Fisheries Protection (1)**
	- Capacity to embark USCG personnel and conduct patrols and intercept
1.4.1	**Training Ability (6)**
	- Capacity to transport, berth, sustain training teams
1.4.1	**Training Capacity (4)**
	- Onboard classroom space

Figure 122: Recapture of P.E. Weights and Scores for Simulation

4. Modeling and Simulation Environment

For the Peacetime Engagement Modeling and Simulation environment we utilized Naval Simulation System-21 (NSS-21). Many of the platforms utilized were inherent to

the system with all parameters previously defined. Several of the platforms and weapons systems however were not inherent to the system. To overcome this we created these platforms and utilized the data on the actual platforms to determine the parameters of the simulation platforms. This data was taken from Jane's High-Speed Marine Transport, Jane's Fighting Ships, the U.S. Navy website, briefs provided by the HSV-2 Swift crew, and information from Sailors who had served aboard these ships. Below is a spreadsheet showing the parameters that were entered into the simulation for each platform or system.

Simulation Information Entered

Platform	Attribute	Specifications
RPG	Field of View Width	360 degrees
	Max Range	500m
	Min Range	0m
	Weapon Signature Altitude	10 feet
	Weapon Signature Duration	30 sec
	ID Weapon Type	Other
	Blast Radius	5m
	Lethality Type	Normal
	Fly Out Speed	280 m/s
	Perceived Intercept Point	Launch
	Reliability	0.5
	Terrain LOS Restrictions	TRUE
	Target Medium	Surface
Small Fast Craft	Comms Detectability	TRUE
	Number of Personnel Onboard	9
	Detectable Signatures	Simple Optical Signature Simple RCS Simple SIGINT
	Evasion Duration	30 min
	Evasion Speed	25 knots
	Asset ID	Ship - Swarm Craft
	Tactical Response Speed	25 knots
	Transit Speed	10 knots
	Sensors	Mk1 eyeball
	Damage Effects Speed	TRUE
	Damage Correlation Coefficient	0.5
	Re-Fire Delay	30 sec
	Max Weapons in Flight	3
HSV	Weapons Selection	Best Time
	Fuel Burn Profile	Burn Profile Altitude Key 0
	Number Of Personnel Onboard	107
	Data Processing Module	Default Fusion

	Detectable Signatures	Optical Vul Radar Vul Infrared Vul Passive Acoustic Vul Active Acoustic Vul
	Asset Height	66 feet
	Evasion Speed	45 knots
	Tactical Response Speed	45 knots
	Transit Speed	15 knots
	Radar	Lowlite TV
	Weapon Systems	MK96 (25mm and 40mm) Snake eyes
RORO (1stLT Harry L. Martin)	Number of Personnel	50
	Data Processing Module	Default Fusion
	Detectable Signatures	Simple RCS Simple Optical Signature
	Asset Height	25 feet
	Tactical Response Speed	17 knots
	Transit Speed	17 knots
	Sensors	Weather Radar Radar Warning Receiver
	Weapons	None
AS Emory S Land	Fuel Burn Profile	Burn Profile Altitude Key 0
	Number of Personnel	1363
	Data Processing Module	Default Fusion
	Detectable Signatures	Optical Vul Infrared Vul Radar Vul
		Passive Acoustic Vul Active Acoustic Vul
	Asset Height	96 feet
	Evasion Speed	20 knots
	Tactical Response Speed	20 knots
	Transit Speed	12 knots
	Sensors	MK 15 Srch/Trk SPS-10
	Weapons	4 50 cal
MK96 (25mm and 40mm)	Max Weapons in Flight	200 rds
	Blast Radius	5 meters
	Max Range	6800 meters
	Max Angle	45 deg
	Lethality Type	Normal
	Terrain LOS Restrictions	TRUE
Snake eyes	Max Weapons in Flight	200 rds
	Blast Radius	5 meters
	Max Range	6800 meters
	Max Angle	45 deg
	Lethality Type	Normal

	Terrain LOS Restrictions	TRUE
50 cal	Max Weapons in Flight	200 rds
	Blast Radium	0
	Max Range	1500
	Max Angle	45 deg
	Lethality Type	Normal
	Terrain LOS Restrictions	TRUE
LPD-17 San Antonio	Fuel Burn Profile	Burn Profile Altitude Key 0
	Personnel	360
	Data Processing Module	Default Fusion
	Detectable Signatures	Optical Vul Infrared Vul Radar Vul Passive Acoustic Vul Active Acoustic Vul
	Asset Height	96 feet
	Evasion Speed	22 knots
	Tactical Response Speed	22 knots
	Transit Speed	10 knots
	Weapons	MK 46
Oil Platform	Detectable Signatures	Optical Vul Infrared Vul Radar Vul
	Asset Height	1700 feet
	Icon	Land_Fac
	Operating Medium	Surface

Figure 123: Simulation Data

Another aspect of NSS-21 is the Probability of Kill (P_k) tables and the Damage tables. These tables are a requirement for the scenario to run properly, even though combat engagements were not the focus or purpose of our simulation. To fill in the P_k and Damage tables we did not have hard data to analyze so we made assumptions about the accuracy of the weapons as well as the environment in which they were to be utilized to determine appropriate values. For example, an RPG fired from a fast moving small boat is not going to be very accurate or precise. Below is a spreadsheet of the values utilized; keeping in mind that no engagements occurred in our scenario due to real-world tactics of MEND and our simulated Rules of Engagement.

P_k Table Inputs			
System	**P_k**	**Platform**	
MK96 (25mm and 40mm)	0.3	Small Fast Craft	
Snake eyes	0.25	Small Fast Craft	
50 cal	0.2	Small Fast Craft	
RPG	0.005	CG	
	0.005	FFG	
	0.005	AS	
	0.01	HSV	
	0.01	RORO	
	0.000001	SH-60B	
	0.005	LPD	
MK45	0.8	Small Fast Craft	
MK76	0.7	Small Fast Craft	

Damage Table Entries

System	Linear	Linear Coefficient	Platform
MK96 (25mm and 40mm)	Yes	0.2	Small Fast Craft
Snake eyes	Yes	0.15	Small Fast Craft
50 cal	Yes	0.1	Small Fast Craft
RPG	Yes	0.0001	CG
	Yes	0.0001	FFG
	Yes	0.0001	AS
	Yes	0.01	HSV
	Yes	0.01	RORO
	Yes	0.9	SH-60B
	Yes	0.0001	LPD

Figure 124: Probability of Kill Table

In the simulation we had several small fast craft assigned to the MEND forces. They proceeded from the Niger Delta to the offshore oil platform and then returned to the Delta to retreat up the Bonny River.

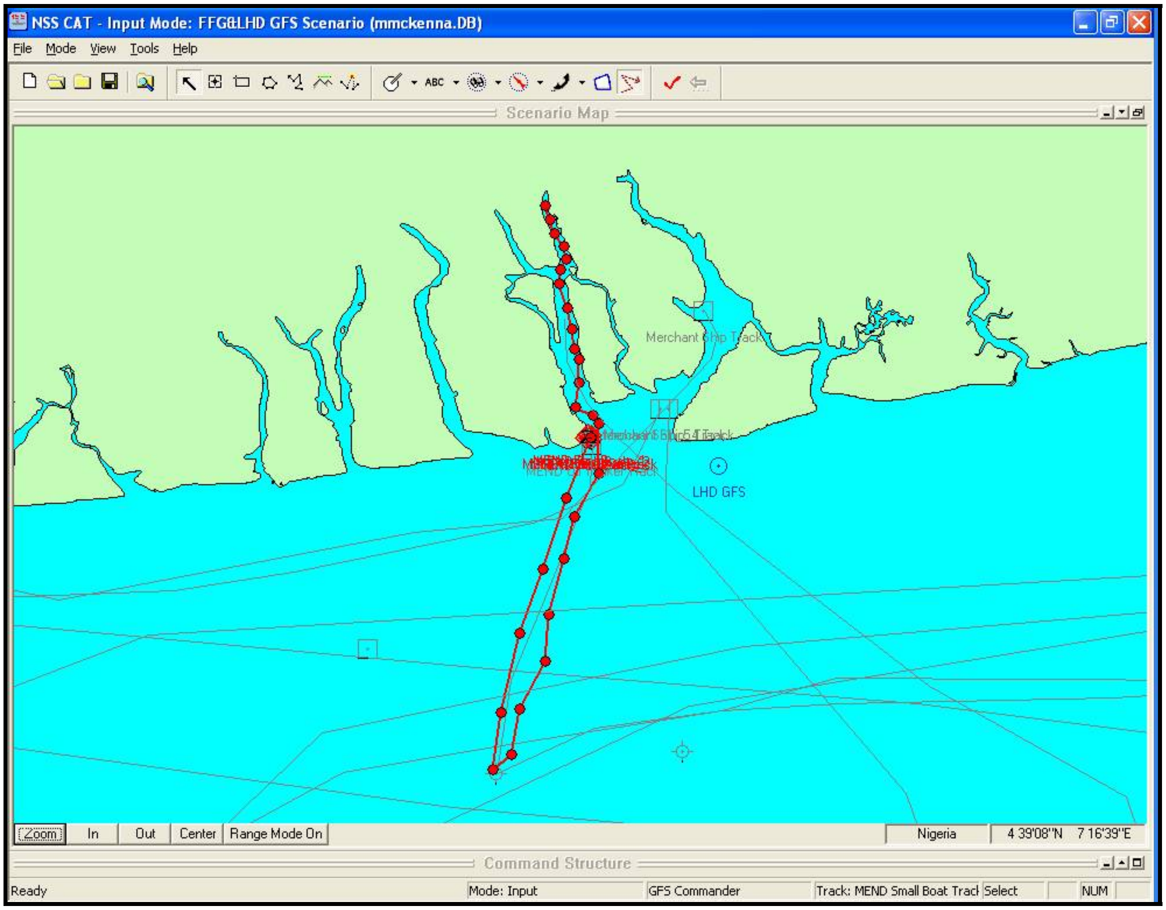

Figure 125: NSS Snapshot: MEND Small Fast-Craft Track

The following track is the route of the MEND Oil Tanker used to conduct oil bunkering operations (stealing oil from the oil platform). The track shown is the full track the tanker would have taken if not intercepted by the GFS.

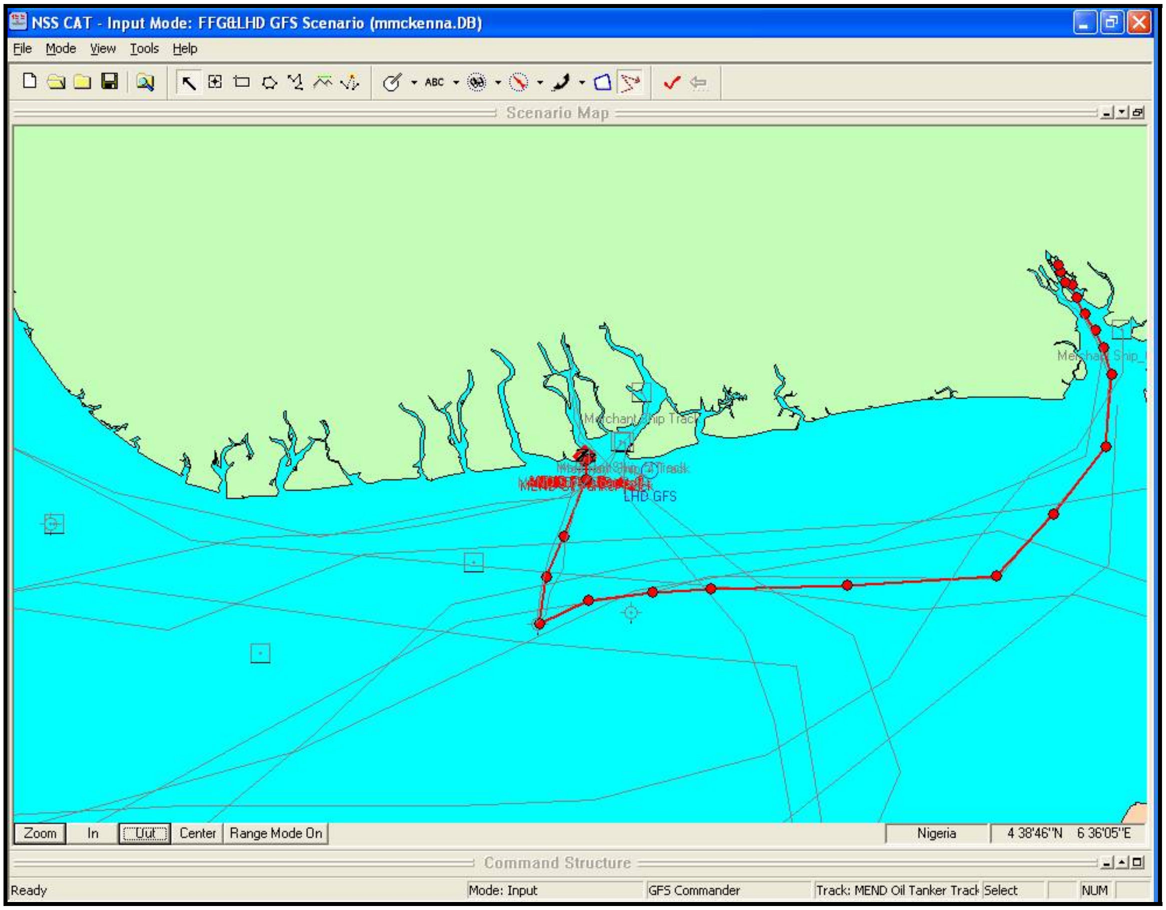

Figure 126: NSS Snapshot: MEND Oil Tanker Track

The following course was utilized for the GFS platforms (with the exception of the RORO and the LHD). The track starts out simulating training in an operating area. Once the MEND forces attack the oil platform, the GFS receives a call for help and proceeds at maximum speed toward the oil platform. The GFS then pursues the MEND Oil tanker which is subsequently boarded and stopped.

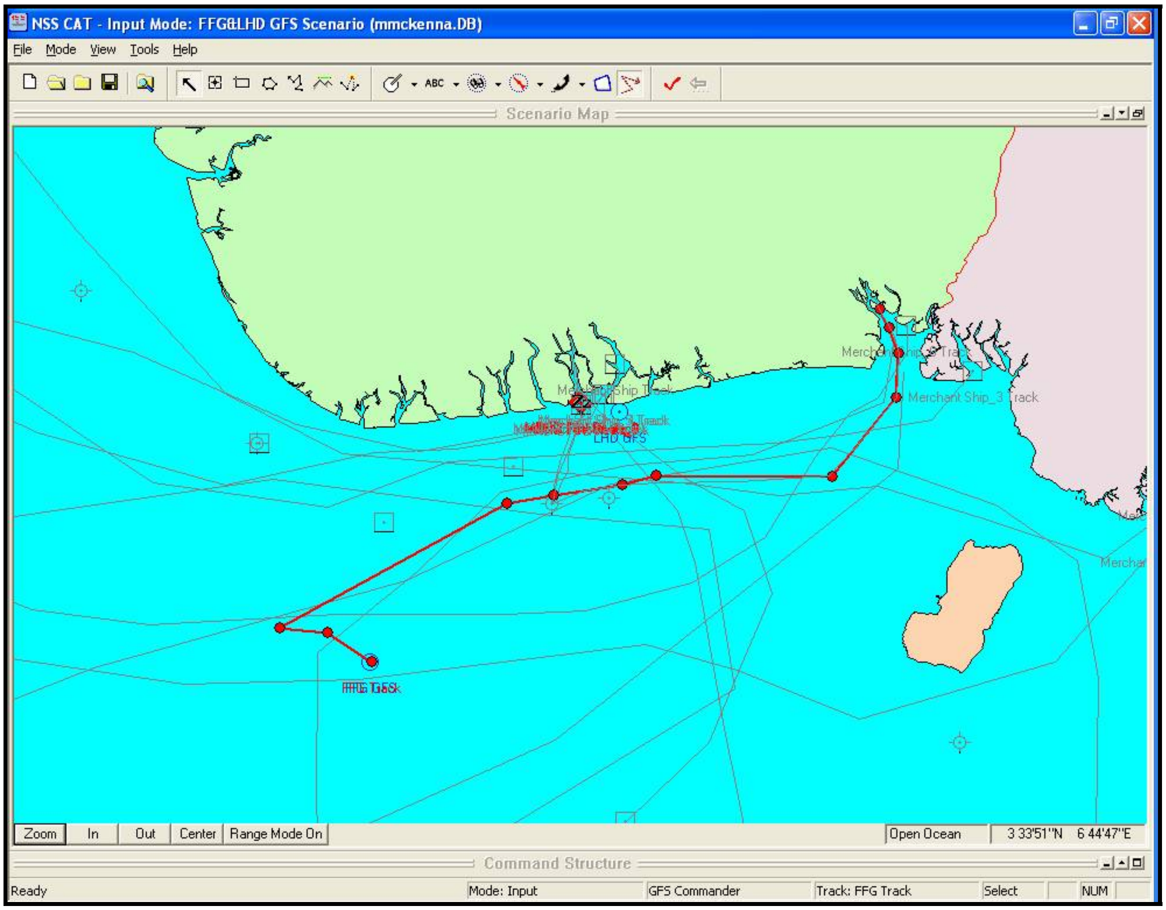

Figure 127: NSS Snapshot: GFS Track

In the simulation the RORO was placed in-port and was not actively involved in the scenario. The LHD however, was given an operating area in which to loiter, depicted below.

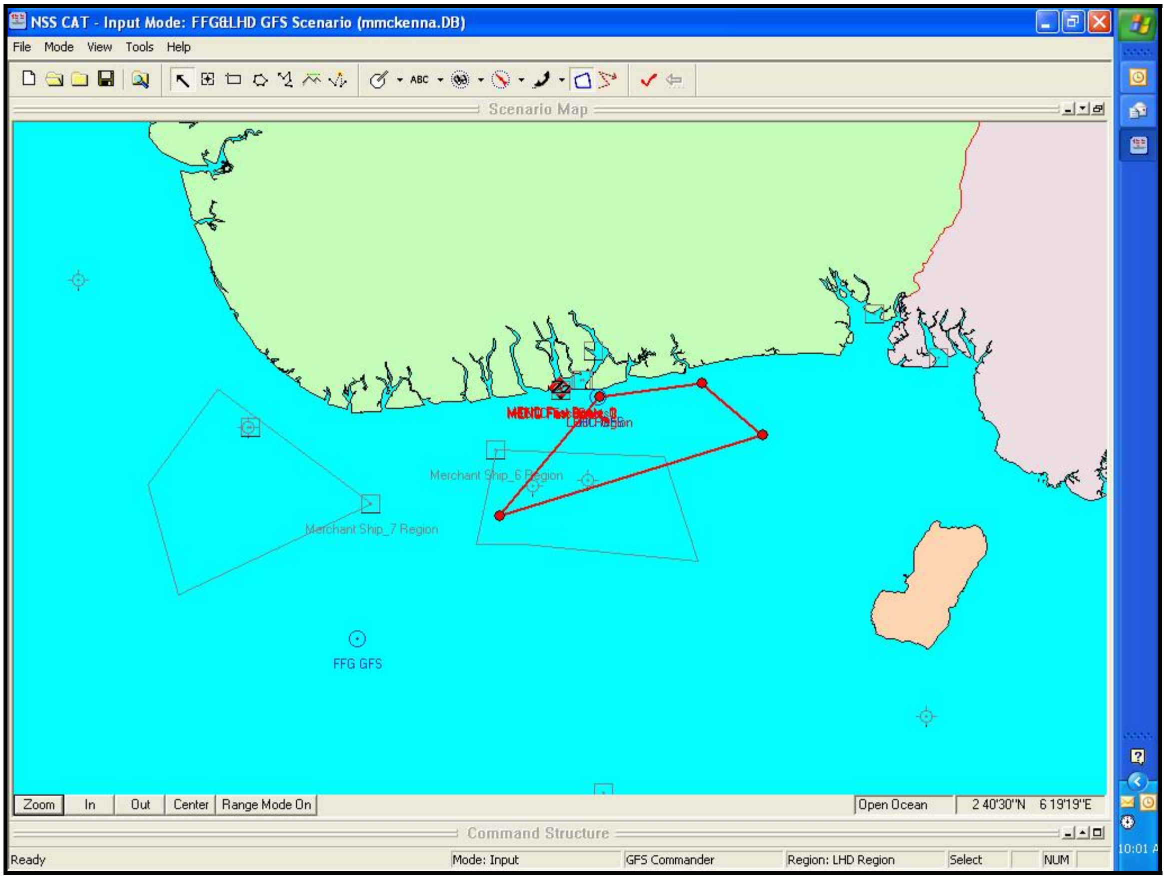

Figure 128: NSS Snapshot: LHD Loiter Area

5. Key Assumptions

a. Sensor Hand-off

The MEND tanker will be identified and classified at the oil platform, but no assets will be available to track it. General speed and heading will be estimated.

b. Location of Oil Platform, and MEND Fast Boat Employment

The location of the oil platform is about 26 nautical miles off the coast, near Bonny Island. This is based on a New York Times article from June 2006: “armed

rebels raided an oil drilling rig 40 miles off the Nigerian coast early yesterday and kidnapped eight foreign oil workers in the latest of a string of violent incidents meant to disrupt oil production in the country's oil-rich Niger Delta region … Twenty to 30 attackers aboard four speedboats fired shots and stormed the platform, according to Reuters, which cited unidentified security officials. No one was injured."[380]

c. Distribution of Merchant (WHITE) Traffic in AO

Fifteen ships are distributed throughout the region, providing an adequate challenge to the detection and identification capabilities of BLUE assets. They transited from the open ocean to high traffic ports in the region and from the high traffic ports to the open ocean. There were also several smaller WHITE vessels that randomly transited the region to simulate fishing vessels.

d. Force Protection

For the purpose of the NSS simulation, we assume that Force Protection requirements, especially while underway, will be met. The Force Protection attribute will be evaluated independent of the scenario for each system alternative.

6. Modeling & Simulation Inputs & Conditions

Sample size: n = 70; a conservative estimate of the sample size needed to estimate any MOE (represented as a proportion) to within 10% with a 90% confidence interval:[381]

$$n = \left(\frac{z_{\alpha/2}\sqrt{\hat{p}(1-\hat{p})}}{W} \right)^2 = \left(\frac{1.645\sqrt{0.5(1-0.5)}}{0.10} \right)^2 \approx 68$$

[380] Mouawad, Jad, "8 Foreign Workers Abducted From an Oil Rig Off Nigeria," *New York Times*, June 3, 2006, http://www.nytimes.com/2006/06/03/business/worldbusiness/03oil.html.

[381] Keller, Gerald, *Statistics for Management and Economics,* (United States: Thomson Brooks/Cole, 2005, 7th ed.) 386.

For each GFS platform, the simulation was run 70 times with a specification of less than 5% standard deviation. 70 replications were enough to ensure that this requirement was met. Mean values were reported.

- RED forces: 5 MEND fast boats
  - 1 MEND tanker disguised as WHITE
  - Weaponry: Small arms (AK-47's and Rocket Propelled Grenades)[382]
- WHITE traffic: 15 generic merchant ships
- BLUE forces: GFS platform as required

There were 4 single-platform and 2 two-ship combinations chosen as evaluation subjects for GFS system alternatives.

GFS System Alternatives	CG	LPD-17	HSV	AS	LHD & FFG	HSV & RORO

Figure 129: Recapture of GFS Ship Alternatives for Simulation

In order to standardize the inputs across the modeling and simulation efforts of all three GFS mission area teams, the following aviation and waterborne complements for the platforms were agreed upon:

Platform	CG	FFG	HSV	LHD	LPD-17	AS	RORO
Water-borne	2 RHIB	1 RHIB	2 RHIB or 2 SURC	2 RHIB 3 LCACs	2 RHIB 2 LCACs	2 MWB	1 RHIB
Airborne	2 SH-60B	2 SH-60B	1 SH-60B	12 CH-46E 9 CH-53D/E	2 CH-46E	None	None

Figure 130: Recapture of Connector Assets for Simulation

7. Utility Grading Approach by Attribute

Refer to Functional Needs Analysis.

382 Wellington, Bestman, "Weapons of War in the Niger Delta," The Jamestown Foundation: *Terrorism Monitor* 5, no. 10 (May 24, 2007), http://www.jamestown.org/terrorism/news/article.php?articleid=2373428.

APPENDIX D: COST DATA

		EMORY S LAND	06/06/06 IWO JIMA	06/06/06 NICHOLAS	06/06/06 PHILIPPINE SEA	SAN ANTONIO
1.0	Direct Unit Cost					
1.1	Personnel	67,044,714	63,122,458	13,020,611	19,951,966	21,923,963
1.2	Unit Level Consumption	11,754,110	23,483,629	6,780,070	14,596,985	6,030,475
1.3	Purchased Services	1,958,064	307,704	130,909	190,601	84,670
		80,756,888	**86,913,790**	**19,931,591**	**34,739,552**	**28,039,108**
2.0	Maintenance - Intermediate					
2.1	Labor - Intermediate Maintenance	1,124,079	295,344	609,365	689,349	124,686
2.2	Material - Intermediate Maintenance	495,435	72,129	109,272	104,167	2,944
2.3	Commercial Industrial Services	93	497,588	88,786	149,440	37,267
		1,619,608	**865,061**	**807,423**	**942,956**	**164,897**
3.0	Maintenance & Modernization - Depot					
3.1	Maintenance - Scheduled - Depot	0	547,780	0	694,339	0
3.2	Maintenance - Nonscheduled - Depot	10,715,229	4,018,582	2,351,797	1,636,167	36,000
3.3	Fleet Modernization	127,810	401,501	183,454	73,153	149,751
3.6	Equipment Rework	0	140,940	19,295	15,563	70,470
3.7	Design Services Allocation	444,006	1,573,226	0	0	0
		11,287,045	**6,682,028**	**2,554,546**	**2,419,222**	**256,220**
4.0	Other Operating & Support					
4.1	Training	2,999,452	3,276,878	686,561	1,048,564	1,171,084
4.2	Publications	11,382	1,706	363	4,153	60
4.3	Engineering & Technical Services (ETS)	6,279	86,323	94,425	18,495	87,168
		3,017,114	**3,364,907**	**781,349**	**1,071,212**	**1,258,312**
	Annual Operational & Support Cost	96,680,655	97,825,786	24,074,908	39,172,942	29,718,537
	Average 6-month Deployment Cost	47,678,131	48,242,854	11,872,558	19,318,163	19,594,640

Figure 131: VAMOSC Ship Costs (SEA-12 Calculations in Red)

	CH-46E			CH-53E			SH-60B		
	Total Cost	Cost per Aircraft	Cost per Flying Hour	Total Cost	Cost per Aircraft	Cost per Flying Hour	Total Cost	Cost per Aircraft	Cost per Flying Hour
1.0 Mission Personnel									
1.1 Operations	40,182,837	186,897	746	34,882,531	242,240	1,124	77,730,818	532,403	1,298
1.2 Maintenance	49,567,195	230,545	920	60,909,667	422,984	1,962	124,239,975	850,959	2,075
1.3 Other Mission Personnel	13,389,689	62,278	249	12,682,247	88,071	409	31,181,830	213,574	521
	103,139,721	**479,720**	**1,915**	**108,474,445**	**753,295**	**3,495**	**233,152,623**	**1,596,936**	**3,894**
2.0 Unit Level Consumption									
2.1 POL/Energy Consumables	23,062,750	107,269	428	31,730,309	220,349	1,022	21,567,438	147,722	360
2.2 Consumable Materials/Repair Parts	62,672,417	291,500	1,164	57,528,479	399,503	1,853	43,308,819	296,636	723
2.3 Depot Level Repairables	131,963,831	613,785	2,450	213,312,024	1,481,334	6,872	146,972,585	1,006,662	2,455
2.4 Training Munitions/Expendable Stores	0	0	0	0	0	0	8,355,416	57,229	140
2.5 Other	2,097,375	9,755	39	2,002,406	13,906	65	70,933	486	1
	219,796,373	**1,022,309**	**4,081**	**304,573,218**	**2,115,092**	**9,813**	**220,275,191**	**1,508,734**	**3,679**
3.0 Intermediate Maintenance									
3.1 Maintenance	93,397,117	434,405	1,734	77,697,570	539,566	2,503	42,723,858	292,629	714
	93,397,117	**434,405**	**1,734**	**77,697,570**	**539,566**	**2,503**	**42,723,858**	**292,629**	**714**
4.0 Depot Maintenance									
4.1 Overhaul/Rework	84,716,971	394,032	1,573	106,458,129	739,293	3,430	27,893,246	191,050	466
4.2 Other	8,566,998	39,847	159	4,554,761	31,630	147	3,328,674	22,799	56
	93,283,969	**433,879**	**1,732**	**111,012,890**	**770,923**	**3,577**	**31,221,920**	**213,849**	**521**
5.0 Contractor Support									
5.2 Contractor Logistics Support	16,396,999	76,265	304	5,210,246	36,182	168	3,366,505	23,058	56
5.3 Other	1,051,375	4,890	20	1,169,954	8,125	38	1,558,068	10,672	26
	17,448,374	**81,155**	**324**	**6,380,200**	**44,307**	**206**	**4,924,573**	**33,730**	**82**
6.0 Sustaining Support									
6.2 Modification Kit Procurement/Installation	75,497,830	351,153	1,402	27,251,765	189,248	878	12,018,943	82,322	201
6.3 Other Recurring Investment	551,359	2,564	10	369,283	2,564	12	374,411	2,564	6
6.4 Sustaining Engineering Support	1,920,073	8,931	36	1,253,370	8,704	40	1,282,850	8,787	21
6.5 Software Maintenance Support	2,272,887	10,572	42	1,928,134	13,390	62	2,388,264	16,358	40
6.6 Simulator Operations	527,540	2,454	10	814,443	5,656	26	1,747,641	11,970	29
6.7 Other	8,919,427	41,486	166	9,975,970	69,278	321	5,274,253	36,125	88
	89,689,116	**417,159**	**1,665**	**41,592,965**	**288,840**	**1,340**	**23,086,362**	**158,126**	**386**
7.0 Indirect Support									
7.1 Personnel Support	2,979,112	13,856	55	3,468,047	24,084	112	3,436,602	23,538	57
	2,979,112	**13,856**	**55**	**3,468,047**	**24,084**	**112**	**3,436,602**	**23,538**	**57**
	619,733,782	**2,882,483**	**11,506**	**653,199,335**	**4,536,106**	**21,044**	**558,821,129**	**3,827,542**	**9,334**
Average 6-month Deployment Cost per Aircraft			1,438,244			2,272,803			1,913,419

Figure 132: VAMOSC Helicopter Costs (SEA-12 Calculations in Red)

Please note, the following cost data provided by VAMOSC on MSC ships was not used, as their data was not complete in this instance. We used costs provided directly from MSC for those ships.

		1ST LT HARRY L MARTIN	SWIFT
		2006	2006
1.0	Mission Personnel	595	
2.0	Unit-Level Consumption	8,002,048	14,515
4.0	Depot Maintenance	4,443,374	390,273
5.0	Contractor Support	7,810,364	10,003,369
6.0	Sustaining Support	4,317,630	933,037
7.0	Indirect Support		
	Total Cost	41,337,063	12,679,019
A.1	Number of Officer Personnel - Navy	0	
A.2	Number of Enlisted Personnel - Navy	0	
A.3	Civilian Service Mariners	0	
A.4	Contract Mariners	28	
B.1	Steaming Hours Underway	2,630	
B.2	Steaming Hours Not Underway	5,496	
B.3	Hours Cold Iron	634	
C.1	BBLS Fuel Used Underway	44,025	
C.2	BBLS Fuel Used Not Underway	14,041	
C.3	BBLS Fuel Used Auxiliary	660	
	Average 6-month Deployment Cost	3,905,182	5,001,685

Figure 133: VAMOSC Cost Figures for MSC Ships

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APPENDIX E: RISK SUMMARY

	Risk Decision Record				
Ris	"if_"	"then_"	Probability	Impact	Actions
	What could go wrong?	What are the consequences?	5 = High	5 = Severe	Assume/Accept, Avoid, Control/Mitigate, Transfer/Delegate
1	LEADERSHIP		3	5	
	U.S. Government leadership and/or U.S. Navy does not support GFS concept or deployment of GFS platform to troubled parts of the globe.	GFS cancelled or scope of GFS deployment reduced. (The current sea basing concept may be used instead.)	GFS was conceptualized under the former CNO; the current CNO's view on GFS is unknown. The Navy's current shipbuilding plan combined with instability throughout the world may prevent the use of a Naval platform for GFS.	Lack of GFS deployment may not affect combat readiness of the Navy, but will have direct affect on State Department and any diplomatic initiatives.	Assume risk; budget constraints, current and future combat operations require downsizing of US Navy and non-essential fleet operations. The shrinking size of the current fleet and problems with the 30-year shipbuilding plan will negatively impact any GFS platform or deployment. The Congress and USN must incorporate GFS into a shipbuilding and deployment plan. Navy and State Department cooperation is key to implementing and properly deploying GFS around the globe.
2	RELATIONS (GFS - GoG)		3	4	
	Fluctuating relationships with GoG countries. Not all the countries in the GoG region are willing to participate in GFS due to an unfavorable relationship with the United States or the goals of GFS are not inline with host countries goals.	Should GoG nations not participate in GFS, the overall effectiveness of executing GFS missions will be diminished. The amount of effectiveness diminishment is dependent on which countries that do not wish to participate in GFS; ie Nigeria would have more of an impact vs. Ghana.	Currently there are no nations that are totally against receiving assistance from the United States. But many nations are skeptical on how the US will proceed with their affairs in Africa.	GFS effectiveness is heavily dependent on the cooperation, involvement, and acceptance of host nations to allow GFS to operate in their country and territorial waters.	Should GoG nations decline or are hesitant to US assistance, the US State Department should be fully engaged in commencing dialogue to garner support for the host countries involvement with GFS; highlighting the positive aspects of increased stability and security throughout the region.
3	RELATIONS (GFS - NGO)		1	2	
	Fluctuating relationships with NGOs and GFS.	GFS may not carry NGO aboard and then potentially have a reduced mission in the region.	The screening process for which NGOs are welcomed and chosen to participate in the GFS will likely act as the first line of defense for choosing NGOs which will have little conflict with GFS operations.	The impact of NGO conflicts with the GFS mission is relatively low and will not dramatically affect the GFS' ability to conduct other missions within the region.	Accept risk; NGO's will need to coordinate with GFS planners long before they come aboard. Potential conflicts should be easily resolved if they occur while en route, on station or afterward. Once the NGO has disembarked, there will be time to resolve more significant conflicts.
4	RELATIONS (GFS - U.S. Agencies)		1	4	
	GFS is envisioned as a joint and/or interagency operation; traditonal service boundaries and/or bureaucratic barriers may prevent efficient cooperation.	Undermines legitimacy as well as capbility of GFS to accomplish mission.	Interagency coordination is a fundamental mission of GFS and through determined planning and cooperation this is a low risk.	Consequences are less than severe, but threatening to strategic planning.	Managed through determined planning and cooperation; establish GFS program office and identify funding sources for interagency and/or in-country cooperation.
5	RELATIONS (GoG - NGO)		2	3	
	Fluctuating relationships with NGO and host nations.	1. NGO carried by GFS may no longer be welcomed by host nation. 2. Political capital must be used to promote NGO (assuming NGO already aboard GFS) 3. Limited effectiveness in GFS missions	NGOs have in the past supported host nation opposition groups and therefore have been unwelcomed.	The ability of GFS to perform the missions associated with NGO support (diplomatically and logistically) rely heavily on the NGO being welcomed by the host nation.	1. Accept risk due to low probability. 2. In order for NGO to proceed with mission, the US will need to intercede on their behalf. This is possibly politically embarrassing and costly if the host nation agrees, but later is found to have been correct to deny access.

Figure 134: Risk Summary 1

6	RELATIONS (GoG - U.S. Agencies)		1	4	
	Fluctuating relationships with US government agencies and host nations.	1. GFS may not be welcomed by host nation, since the nation may not make the distinction between GFS and particular agency with which they have a conflict. 2. Limited effectiveness on GFS deployment due to host nation hostility, souring of neighboring states could have significant consequences for the GFS and U.S. - host nation relations.	Mindful and thorough planning should keep the probability of this situation low.	The impact of such a situation would not be difficult for the GFS to overcome, since it could simply go elsewhere, however the greater concern would be the souring of GFS support in the region.	1. Accept risk due to low probability, however government agencies must be particularly mindful of negative perceptions and/or repercussions. 2. In order for the GFS to accomplish its mission, it must be welcomed by the host nation. Political capital must be used to promote US agency and GFS (assuming NGO already aboard GFS).
7	PEER COMPETITION		3	4	
	A peer competitor's influence in the region surpasses the U.S. influence and the peer competitor's priorities oppose that of the U.S.	The GFS's effectiveness and value in the region will become diminished. It will hamper efforts to accomplish it's mission because cooperation with host countries as well as being able to influence them is vital to shaping and stability operations.	China is currently a strong economic influence in the region, specifically Nigeria. China's priorities don't always align with those of the U.S.	Consequences are less than severe, but threatening to strategic planning.	Mitigate risk by coordinating with peer competitor to utilize GFS to accomplish operations that align with both countries' priorities; Transfer risk to the treasury and state departments to increase our influence in the region financially.
8	OPERATIONAL AVAILABILITY		4	3	
	Operational availability of USN and USNS assets preclude use of the desired platform for the GFS mission for any number of reasons.	Accept less than ideal platforms; delay or cancel GFS deployments	Current wartime and other operational requirements will very likely limit what platforms are available for GFS.	Although perfomance may be reduced, GFS mission(s) can still be accomplished with alternative platforms.	Assume risk and prepare list of alternative platforms, platform modifications, and/or CONOPS.
9	FUNDING		4	4	
	Congressional and Department of Defense funding may limit the ability of GFS to perform the missions set forth.	Issues of this nature will lead to limited mission effectiveness, delays in platform deployment or possible program cancellation.	Funding is rarely guaranteed and will be a persistent issue.	Consequences are less than severe, but threatening to strategic planning.	Control risk by ensuring proper fiscal planning; establish a GFS proponent in the form of program office, staff, or committee to oversee a pre-determined budget and/or request additional funding from Congress when deemed necessary. Identify funding sources in host nations for aid and/or training.
10	THREAT LEVEL INCREASE		2	4	
	Threat level in the area of operations (AO) increases for any number of reasons.	Escalation poses a danger to GFS platform itself, as well as ability to accomplish its mission.	Armed piracy in the Gulf of Guinea is frequent; many GoG nations are recovering from civil instability w/in the last decade.	Antithetical to GFS mission; GFS is not intended for operations in an increased threat environment.	Some risk is assumed in PE scenario; Avoid risk by avoiding specific threat areas; Control risk by continuing with GFS mission and/or ensuring robust force protection measures.
11	COLLATERAL DAMAGE		1	5	
	Risk of friendly fire or collateral damage due to MEND tactics; operational proximity to WHITE traffic.	Probable antagonistic affect on relations with GoG countries, the foundation of the GFS mission.	Routine engagment is unlikely, but opposition is even more unlikely to be uniformed or otherwise easily identified.	Disastrous.	Control risk through training, ROEs, or technology such as stabilized gun mounts.
12	MULTI-TASKING		4	3	
	Risk of more than one simultaneous mission. GFS is in port, therefore it can not perform missions at sea	Platforms will be unable to perform all the missions	The scenarios only considered performing a single function at a time. The probability of performing pierside/training missions while performing Counter Piracy is high	Depending on the mission which must be ignored, the impact could range from severe to inconsequential	1. Transfer risk with Global Maritime Partnership. 2. Assume risk by deploying a single platform 3. Control risk by sending a multi-platform contingency

Figure 135: Risk Summary 2

APPENDIX F: CNE AND NPS INTERACTION

We believe that several opportunities exist in which to "test our process," beyond the realm of the borders on the Naval Postgraduate School. The perfect opportunity for this may lie with the regional commander who currently holds direct influence in the region that we focused our study on: Commander, Naval Forces Europe. This may be the ideal situation for three reasons: 1) the ability of our process to complement changing dynamics of decisions to be made in fostering regional stability, 2) prior interaction between SEA-12 and CNE, and 3) similarities in approach to geo-political and regional issues by CNE to that described in this study.

A. APPLYING OUR PROCESS TO NAVAL FORCES EUROPE'S PLAN

Over the past two years, Admiral Henry Ulrich (CNE-C6F) established a new maritime approach to engaging with West and Central African nations. One of the outcomes is the APS – what we have considered in our study as a GFS pilot – and is intended to help develop the nations of this region improve maritime governance through an emphasis on Maritime Safety and Security training and interaction. This latter term – maritime safety and security - is used often by CNE, and in our opinion, represents closely what we called Shaping and Stability, but with a heavier emphasis on the maritime and on the military-to-military aspects of Shaping and Stability. Admiral Ulrich stated "APS is about a long term effort to assist our African partners in developing the capacity to safeguard their territorial waters and their Exclusive Economic Zones. It is <u>not</u> about dispensing aid or delivering equipment."[383] This quote marks an obvious shift in emphasis from what we determined as mission priority in our study, but we believe it also highlights the applicability of our process towards the disposition of a particular theater commander.

[383]. U.S. Navy Office of Information, "Africa Partnership Station (APS): Promoting Maritime Safety and Security," *Rhumb Lines*, http://www.navy.mil/navco/speakers/currents/Africa%20Partnership%20Station%2025%20OCT%2007.pdf

Applying this shift in emphasis away from the humanitarian missions, and toward the military-to-military role of APS, we factored this into our model, setting our Peacetime Engagement mission weight as a .8 (vice .5).

We also understand that Admiral Ulrich's statement was not intended to neglect the humanitarian issues of the region, either, as APS is intended to "provide a maritime support platform for more than 20 humanitarian assistance projects in eight countries." Therefore, we assigned a value of .1 to both our HA/DR and Interagency & NGO Coordination mission weights.

The following depicts the recommendations that we would make to CNE concerning ideal platforms for the APS role, out of current inventory:

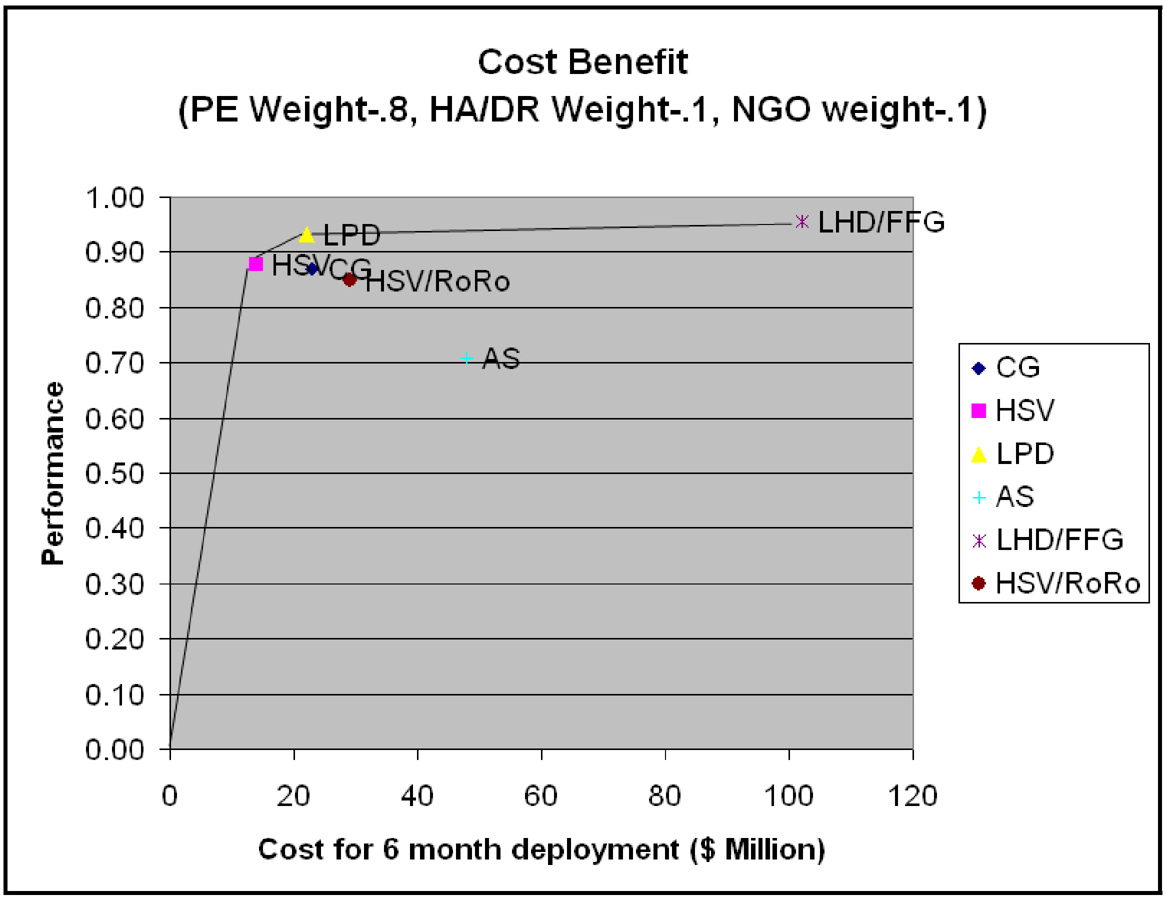

Figure 136: Cost-Effectiveness Results for CNE

The shift in emphasis on mission priorities did not change our results significantly, with the HSV and LPD alternatives topping the list of platforms we would recommend to CNE. These recommendations resemble what CNE is planning on using for APS: an HSV and an LSD (USS Fort McHenry). This latter analogy, however, must be tempered in the knowledge that we have not conducted any quantitative and performance comparisons between the LPD-17 and LSD-41 classes of ships, and it is based solely on the knowledge that they are both amphibious ships of similar size. In addition, the CG improved from an expected value performance score of 71% to 87%, and falls close to the "bend in the knee" for acceptable cost.

B. INTERACTION BETWEEN NPS AND NAVAL FORCES EUROPE

We had two occasions in which to send SEA-12 representatives to interact with Navy, State Department, DoD, NGO, and host-nation representatives, both hosted by CNE: the GFS Planning Conference for FORT MCHENRY's deployment in July of 2007, as well as to a simulation in Naples. Their observations are expanded upon in the following paragraphs.

1. Africa Partnership Station, and Future CNE Contributions to the GFS Concept

Africa Partnership Station (APS) is CNE's first initiative in energizing this plan, designed to improve MSS in the Gulf of Guinea via collaborative engagement with host nations. It responds to specific African requests for assistance, is aligned with broad international community and U.S. objectives, and is reflective of the mission of the U.S. Africa Command.[384] As was evidenced by the group demographics in a simulation conference held by CNE in November of 2007, APS promises a heavy multi-national and interagency characteristic to achieve maritime governance. APS is inspired by the belief that effective maritime safety and security will contribute to development, economic

[384]. U.S. Naval Forces Europe-U.S. Sixth Fleet, "Africa Partnership Station: An Initiative to Promote Maritime Safety and Security," http://www.c6f.navy.mil/Editor/assets/globalfleetstation/documents/aps%20white%20paper%20final%2021%20oct.pdf.

prosperity, and security ashore - a belief with a strong foundation in all levels of strategic guidance.

Further actions by CNE will include mobile training teams, assistance in increasing maritime infrastructure and NGO initiatives. Lacking in CNE's initiative is a strategic communications plan.

2. CNE's Coordination with Interagency and NGOs: Leading the Way, and Issues to be Resolved

CNE-C6F is viewed as the leading entity in the West Africa initiative. Their plans are well ahead of other agencies. Being in front on the leading edge of placing the GFS concept into practice, CNE-C6F has encountered planning issues with the non-DoD agencies. In its infancy, their plan -formulated to increase maritime safety and security in the region - is just now being introduced to various NGO's, state department organizations, Enduring-Partner Nations and African Nations. As the plan becomes more socialized within the key organizations it will likely become more refined and better equipped to aid stability in the region.

The first step, beyond deployment of FORT MCHENRY, to realizing this goal was the Gulf of Guinea Regional Engagement Simulation held by CNE-C6F in Naples Italy, in November 2007. During this simulation CNE-C6F's plans were presented to regional experts, NGO Representatives, State Department Representatives, Enduring Partner Nations and some representatives from the African Nations. The plans were heavily criticized by some NGO representatives; however, CNE was also highly praised for their forward thinking. By bringing the experts to the table in this type of a forum it allowed CNE to begin to actuate their plan with the key players, and to see the shortfalls as well as the strengths of their initiative. CNE-C6F's model was received well by the panelists. However, it was apparent that the panelists felt that in many ways, the timeline was very aggressive.

As of right now, the United States does not have a national policy regarding West African Maritime Security. What that eludes to is that fact that if we are going to move forward with such plans we as a nation (IE the state department), we need to put forward a public national policy toward the region such as the one that China has recently

published. So far the Navy is operating within navy line but if the intent is to go outside of navy lines we are going to need State Department backing and we do not currently have a consensus on this. There is a Navy vs. State Department perception by some within each group that must be overcome to realize a truly cohesive plan.

3. CNE and NPS: Similarities in Quantitative Analysis

One other interaction included a visit by Mr. Jed Snyder, CNE C6F, who expressed interest in our study. We were encouraged by some of the similarities between our study, and the actions being taken by Naval Forces, Europe. One includes their greatly detailed level of focus on the non-traditional roles called for in the Gulf of Guinea, and their attempts to understand the region through interagency efforts. Of other interest to us was their quantitative analysis of the GFS mission in the Gulf of Guinea, emphasizing "effects based" actions determined from measures and indicators (priorities, MOEs, strategic effects, and indicators). We believe that a shared interest in decision-making based on quantitative analysis, while seeking a value base of understanding before making those decisions, make future partnerships between CNE and NPS desirable.

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APPENDIX G: GLOSSARY OF ACRONYMS

(In alphabetical order)

AFDB – Africa Development Bank

AFRICOM – United States African Command

AGOA – African Growth and Opportunity Act

AIDS – Acquired Immune Deficiency Syndrome

AIS – Automatic Identification System

AO – Area of Operations

AOC – Area of Concern

AOR – Area of Responsibility

APS – Africa Partnership Station

AS – Submarine Tender

AU – African Union

BFEM – Battle Force Email

BOAD – West African Development Bank

C2 – Command and Control

C3 – Command, Control, Coordination

CBA – Capabilities Based Approach

CBR – Chemical, Biological, Radiological

CBT – Capacity Building Team

CEMAC – Central African Economic and Monetary Community

CENTRIX – Combined Enterprise Regional Information Exchange System

CG – Guided Missile Cruiser

CMOC – Civil Military Operations Center

CND – Computer Network Defense

CNO – Chief of Naval Operations

COCOM – Combatant Commander

COIN – Counterinsurgency

CONOPS – Concept of Operations

CONUS – Continental United States

CP – Counter Piracy

CRED – Center for Research on the Epidemiology of Disasters

CRUDES – Cruiser-Destroyer

CUSMC – Commandant United States Marine Corps

CVN – Carrier Vessel Nuclear

DCTS – Defense Collaboration Tool Suite

DDG – Guided Missile Destroyer

DESRON – Destroyer Squadron

DISA – Defense Information Systems Agency

DMS – Defense Message System

DOD – Department of Defense

DOTMLPF – Doctrine, Organizations, Training, Material, Leadership and Education, Personnel and Facilities

DR – Disaster Relief

DRC – Democratic Republic of Congo

DSN – Defense Switched Network

ECOWAS – Economic Community of West African States

EEZ – Exclusive Economic Zone

EHF – Extremely High Frequency

ELISA - Enzyme Linked Immunosorbent Assay

EMIO – Extended Maritime Interdiction Operations

EMSS – Enhanced Mobile Satellite Services

EPZ – Export Processing Zone

EVP – Expected Value Performance

FAA – Functional Area Analysis

FAO – Foreign Area Officer

FFG – Guided Missile Frigates

FGM – Female Genital Mutilation

FHA – Foreign Humanitarian Assistance

FLEC – Front for the Liberation of the Enclave of Cabinda

FLTSATCOM – Fleet Satellite Communications

FMFM – Fleet Marine Forces Manual

FNA – Functional Needs Analysis

FNCB – Foreign Navy Capability Building

FOB – Forward Operating Base

FRP – Fleet Response Plan

FSA – Functional Solution Analysis

GAO – General Accounting Office

GBS – Global Broadcast Service

GCCS – Global Command and Control System

GDMSS – Global Maritime Distress and Safety System

GDP – Gross Domestic Product

GFS – Global Fleet Station

GIG – Global Information Grid

GMP – Global Maritime Partnership

GoG – Gulf of Guinea

GWOT – Global War on Terrorism

HA – Humanitarian Assistance

HA/DR – Humanitarian Assistance/Disaster Relief

HAST – Humanitarian Assistance Survey Team

HF – High Frequency

HIPC – Heavily Indebted Poor Countries

HIV – Human Immunodeficiency Virus

HN – Host Nation

HOC – Humanitarian Operations Center

HSRT – Humanitarian, Stabilization, and Reconstruction Teams

HSS – Health Service Support

HSV – High Speed Vessel

INMARSAT – International Maritime Satellite

ICJ – International Court of Justice

IDC – Independent Duty Corpsman

IDP – Internationally Displaced Persons

IGO – International Governmental Organization

IP – Internet Protocol

IMB – International Maritime Bureau

IMF – International Monetary Fund

IO – International Organization

ISDN – Integrated Services Digital Network

JCA – Joint Capability Area

JCIDS – Joint Capabilities Integration and Development System

JDN – Joint Data Network

JHSV – Joint High Speed Vessel

JP – Joint Publication

JROC – Joint Requirements Oversight Council

JTF – Joint Task Force

JWICS – Joint Worldwide Intelligence Network LAN – Local Area Network

LCAC – Landing Craft Air Cushion

LCAC – Landing Craft, Air Cushioned

LCS – Littoral Combat Ship

LCU – Landing Craft, Utility

LEO – Low Earth Orbiting

LHA – Amphibious Assault Ship

LHD – Amphibious Assault Ship

LMSR – Large, Medium-Speed, roll-on/roll-off

LRC – Library Resource Center

LPD – Amphibious Transport Docks

LSD – Dock Landing Ship

MARAD – Maritime Administration

MASCAL – Mass Casualty

MCADS – Maritime Craft Aerial Drop

MCC – Millennium Challenge Compact

MCWP – Marine Corps Warfighting Publication

MDA – Maritime Domain Awareness

MEND – Movement for the Emancipation of the Niger Delta

MHC – Coastal Minehunters

MHS – Military Health System

MHQ – Marine Headquarters

MILSTAR – Military Strategic Tactical Relay

MIO – Maritime Interdiction Operations

MJP – Movement for Justice and Peace

MLPP – Multilevel Precedence and Preemption

MOC – Marine Operations Concept

MOE – Measure of Effectiveness

MOOTW – Military Operations Other Than War

MPCI – Patriotic Movement of the Ivory Coast

MPF (E) – Maritime Prepositioning Force-Enhanced

MPGA – Marinha de Guerra Popular de Angola

MPIGO – Ivoirian Popular Movement for the Great West

MPLA – Popular Movement for the Liberation of Angola

MSC – Military Sealift Command

MSOC – Maritime Security Operations & Cooperation

MWB – Motor Whale Boat

NACT – Naval Advanced Concepts and Technologies

NAVSEA – Naval Sea Systems Command

NBC – Nuclear, Biological, Chemical

NCB – Non-Combatant Boarding

NDP – Naval Doctrine Publication

NEO – Non-Combatant Evacuation Operations

NFAF – Naval Fleet Auxiliary Force

NGO – Non-Governmental Organization

NIPRNET – Non-Secure Internet Protocol Router Network

NOAA – National Oceanic and Atmospheric Administration

NOC – Naval Operations Concept

NSMS – National Strategy for Maritime Security

NSS – National Security Strategy

NSWG – Naval Surface Warfare Group

NTTP – Navy Tactics, Techniques, and Procedures

NWDC – Naval Warfare Development Command

NWP – Naval Warfare Publication

O & S – Operation and Support

OCONUS – Outside Continental United States

OFDA – Office of U.S. Foreign Disaster Assistance

OPCON – Operational Control

OPEC – Organization of Petroleum Exporting Countries

OPNAV – Office of the Chief of Naval Operations

PC – Patrol Craft

PDG – Parti Democratique Gabonais

POTS – Plain Old Telephone System

POTUS – President of the United States

PRGF – Poverty Reduction and Growth Facility

PVO – Private Voluntary Organization

QDR – Quadrennial Defense Review

R & D – Research and Development

RCC – Regional Combatant Commanders

RHIB – Rigid Hull Inflatable Boat

RMSA – Regional Maritime Situational Awareness

RORO – Roll On/Roll Off

RRF – Ready Reserve Force

S/CRS – Coordinator for Reconstruction and Stabilization, U.S. State Department

SAR – Search and Rescue

SATCOM – Satellite Communication

SCI – Sensitive Compartmented Information

SEAL – Sea, Air, Land (Navy Special Forces)

SHF – Super High Frequency

SINCGARS - Single Channel Ground to Air Radio System

SIPRNET – Secret Internet Protocol Router Network

SLOC – Sea Lines of Communication

SME – Subject Matter Expert

SOF – Special Operations Forces

SOUTHCOM – United States Southern Command

SSO – Shaping and Stability Operations

STEP – Standardized Tactical Entry Point

SURC – Small Unit Riverine Craft

TACLOG – Tactical Logistics

TACMEMO – Tactical Memorandum

TEU – Twenty Foot Equivalent Unit

TSN – Thousand Ship Navy

TV-DTS – Television Direct to Sailor

UAV – Unmanned Aerial Vehicle

UDOP – User Defined Operational Picture

UEMOA – African Economic and Monetary Union

UHF – Ultra High Frequency

UN – United Nations

UNCLOS – United Nations Convention on the Law of the Sea

USAF – United States Air Force

USAID – United States Agency for International Development

USCG – United States Coast Guard

USMC – United States Marine Corps

USN – United States Navy

USNS – United States Naval Ship

VAMOSC – Navy Visibility and Management of Operating and Support Costs

VBSS – Visit, Board, Search, and Seizure

VHF – Very High Frequency

VTC – Video Tele-Conferencing

WAN – Wide Area Network

WMD – Weapons Mass Destruction

APPENDIX H: LIST OF REFERENCES

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